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THE IDENTIFICATION AND CLASSROOM BEHAVIOR OF ELEMENTARY SCHOOL CHILDREN GIFTED IN FIVE DIFFERENT MENTAL CHARACTERISTICS.

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METHODS OF MEASUREMENT AND A SUITABLE CURRICULUM WERE DEVELOPED AND ASSESSED FOR ELEMENTARY SCHOOL CHILDREN GIFTED IN ONE OR MORE OF THE FOLLOWING RESPECTS--SPACE CONCEPTUALIZATION, VOCABULARY, NUMBER ABILITY, LOGICAL REASONING, AND SCIENTIFIC INFORMATION. EXPERIMENTAL AND CONTROL GROUPS WERE ESTABLISHED OVER A 2-YEAR PERIOD. EVALUATION OF SOCIAL AND MENTAL DEVELOPMENT WAS MADE THROUGH STRUCTURED OBSERVATION, ACHIEVEMENT AND APTITUDE TESTING, AND SOCIOMETRIC TECHNIQUES. PROGRAM RESULTS WERE CONSIDERED SUGGESTIVE ONLY, BASED AS THEY WERE ON A RELATIVELY SMALL NUMBER OF CHILDREN. THERE WAS NO EVIDENCE THAT THE STUDENTS WHO RECEIVED SPECIAL INSTRUCTION IN AREAS WHERE SUPERIORITY WAS SHOWN, BENEFITED MORE IN THESE AREAS THAN DID STUDENTS ENROLLED IN REGULAR CONTROLLED CLASSES. SOME SIGNIFICANT DIFFERENCES WERE NOTED AMONG THE BEHAVIOR PATTERNS OF THE CHILDREN IN THE EXPERIMENTAL CLASSES. APTITUDE TEST SCORES FOR BOTH GROUPS WERE COMPARED AND ANALYZED. (JH)

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SECTION I

IDENTIFICATION OF GIFTED ELEMENTARY-SCHOOL CHILDREN

Introduction

For many years the Department of Education of Hunter College has operated demonstration schools for children from preschool through secondary school. These schools, the Hunter College Elementary School and the Hunter College High School, are devoted to the education of intellectually gifted children. The selection of such children for admission to the schools is accomplished by means of examinations. In practice, children who obtain the highest scores on these examinations are identified as "intellectually gifted" and are admitted.

For the Elementary School the admissions examination has for several years been the 1937 edition of the Stanford-Binet Scales and only those children who obtained extremely high IQ's on this test have been considered for admission. Studies of the factorial composition of the items included in the Stanford-Binet Scales have indicated that they are heavily weighted with verbal reasoning ability. In practice, then, "intellectually gifted" children have been identified for admission purposes as those who have high IQ's on this test of general intelligence and are, therefore, outstanding with respect to verbal reasoning ability.

This situation leads to several questions: First, are there intellectual abilities either independent of or only loosely related to verbal-reasoning ability in which some children as young as 4½ to 5½ years of age might prove to be outstanding regardless of their ability in verbal reasoning? Second, can such children be identified by means of suitable tests? Third, what differences can be observed in the classroom behavior of first-grade children selected as outstanding in at least one of several loosely related intellectual abilities? To answer these three questions the present study was undertaken.

Mental Skills To Be Measured

Data relevant to the first question have been gathered over many years. In the early 1900's James McKeen Cattell, working at Columbia University, found that several loosely correlated mental skills could be measured in a sample of undergraduates.

During the 1920's, Spearman (1927), Kelley (1928), Thorndike (1927), Thurstone (1931), and others conducted extensive statistical investigations of the nature of human mental abilities and developed methods for identifying and measuring them. As a result of these basic studies and others that have followed it is clear that human mental ability displays itself in a rather limited number of basic skills and a rather large number of highly specific skills. Indeed, with large samples of examinees and highly reliable measures, it seems possible to divide and subdivide skills again and again and still find tiny segments of variance unique within the particular battery of tests being analyzed. This possibility is largely of academic interest, however, because most of the skills or "factors" thus isolated are measurable only as "difference scores" between other variables and have little utility for effective prediction of variables that it is widely desired to predict.

Of the basic skills that have repeatedly been found in the analysis of human mental ability, four stand out as of major value in predicting performance in activities commonly regarded as intellectual. These are:

1. Space conceptualization, a cluster of skills in judging the spatial relationships and the sizes of objects and in visualizing their movements in space.

Space conceptualization is involved in mathematics courses like geometry and trigonometry, in engineering courses like shop mechanics and drafting, in elementary-school activities like practical arts and drawing, and in occupations like auto mechanics or engineering.

2. Vocabulary, defined as memory for word meanings with reasoning elements, such as those required by verbal analogies, reduced to a minimum.

Knowledge of word meanings has long been regarded as the best single predictor of success in academic courses, especially in the language and social-science fields. It is involved to a marked degree in the work of all professions and most of the subprofessional areas.

3. Number ability, closely defined as memory of the fundamental combinations in addition, subtraction, multiplication, and division as well as skill in using these accurately.

Number ability is of great importance in arithmetic in elementary schools and of considerable importance in more advanced courses in mathematics. It helps to determine performance in science courses, such as physics and chemistry, and in commercial courses like bookkeeping and accounting. It is highly important in determining performance in the latter occupations.

4. Reasoning, the ability to formulate concepts and to weave together ideas and concepts and to draw conclusions and inferences from them.

Reasoning ability is of primary importance in almost all academic fields and in most vocations. It is almost by definition the central element of aptitude for intellectual activities.

In addition to these four, a number of other clusters of skills important in human mental life have been defined and measured successfully. Since none of them has shown evidence of being anywhere nearly so crucial in intellectual activities, it was originally proposed that a measure of social leadership be developed, but with the aroused interest in scientific training that followed the launching of Sputnik I a measure of scientific knowledge was substituted. The fifth area of intellectual ability chosen for measurement in this study was, therefore, that of knowledge of scientific principles and information.

Investigations of the interrelationships of various mental skills have yielded results that are not wholly consistent. For example, a number of studies (Balinsky, 1941; Clark , 1944; Garrett, 1946; Anastasi and Foley, 1949; and Burt, 1954) have led some psychologists to conclude that mental functions become more differentiated as age increases. Other studies (Swineford, 1948, 1949; Vernon, 1950; and Peel and Graham, 1952) have led some psychologists to the opposite conclusion. This point is one of special interest in connection with the present study since we have obtained data pertaining to the intercorrelations of certain mental skills in children aged from about 4½ to 6½ years. In general, our data suggest that the mental skills we measured are markedly differentiated in children as young as 4½ years of age and that there is even greater differentiation a year later.

Preliminary Tests and Their Use

Basic Requirements.

In designing tests of the five areas to be measured, two facts were of controlling importance:

1. The tests were to be administered to children applying for admission to the first-grade class in Hunter College Elementary School. This meant that children between the ages of about 4 years and 3 months and 5 years and 3 months would be tested.

2. Of the applicants tested there would be places in the first-grade class for only a very few of the highest-scoring children.

Given these facts, it appeared necessary to construct tests that would be administered individually, as are the Stanford-Binet Scales. Tests of this type can be administered in such a way as to allow for variations in the examinee's attitudes and to provide the motivation that a skilled examiner can engender through personal contact. They require no reading on the part of the examinee. This was essential.

It was also necessary to construct tests that would permit differentiation among examinees at a very high intellectual level compared with the average at their ages. In short, the tests had to be made extremely difficult for normal children at about age 5.

In addition to these basic requirements, the conditions under which the tests would be used made it desirable that each of the five areas be measured with unspeeded tests that would include a wide variety of activities of interest to young children. Naturally, it was desired to reduce the intercorrelations of the 5 tests by eliminating the overlapping of test variance accounted for by the use of hard words in the directions, by the method of recording responses, and by the effect of personality traits on test performance.

Preliminary Screening Tests.

In September 1957 construction was begun of tests for administration in the Spring of 1958 to applicants for admission to a special first- grade class of 30 pupils in the Hunter College Elementary School. When it was discovered that there were 296 applicants to be tested, the original plan for testing was modified to provide five 12 - item tests to be used for preliminary screening of this large number of applicants. These five tests were administered during the spring of 1958 to 263 applicants. These tests, without the required materials, and the scoring keys are provided in appendix A. Their intercorrelations, reliability coefficients, means, and standard deviations in a sample of 263 applicants are shown in table 1. The means indicate that the tests were of appropriate difficulty for the group but perhaps a little easy for the specialized purpose at hand. Their intercorrelations and reliability coefficients were low, as expected. In fact, on all of the tests except for the number test, the 15-percent confidence interval for an obtained score covered two-thirds of the possible range of scores and the 5-per cent confidence interval covered more than the possible range of scores.

The intercorrelations of these five tests, after correction for attenuation, are shown in table 2. The science test displays moderately high correlations with the other four variables, which is not unexpected. With the exception of the coefficient of .99

TABLE 1

INTERCORRELATION AND RELIABILITY COEFFICIENTS[a] OF TESTS OF 5 DIFFERENT MENTAL CHARACTERISTICS IN PRELIMINARY SCREENING TEST[b] BASED ON A SAMPLE OF 263 APPLICANTS FOR ADMISSION TO HUNTER COLLEGE ELEMENTARY SCHOOL BETWEEN AGES OF 4 YEARS AND 3 MONTHS AND 5 YEARS AND 3 MONTHS

	Space	Vocabulary	Number	Reasoning	Science
Space	.48	.23	.30	.28	.28
Vocabulary		.47	.25	.32	.37
Number			.67	.55	.37
Reasoning				.47	.35
Science					.42
Mean	8.59	7.88	5.10	8.92	5.00
S D	4.06	4.27	4.04	3.96	3.39

[a] Reliability coefficients are in the diagonal cells. These are matched-half coefficients corrected by Angoff's formula no. 16 (Angoff, 1953). The tests were not speeded; every examinee had a chance to try every item.

[b] These tests were constructed by Gordon Fifer, Gerald S. Lesser, and Mary Willis.

TABLE 2

INTERCORRELATIONS IN TABLE 1 CORRECTED FOR ATTENUATION

(N = 263)

	Vocabulary	Number	Reasoning	Science
Space	.49	.52	.59	.61
Vocabulary		.44	.68	.83
Number			.99	.70
Reasoning				.79

between the Number and Reasoning tests, the other coefficients are encouragingly low (remembering that they have been corrected for attenuation and are, therefore, not comparable with the raw intercorrelations often presented).

Preliminary Selection Tests.

From the initial pool of items in each of the five areas tested, a preliminary selection test of 30 items was constructed. These tests, without the required materials, and the scoring keys are provided in appendix A. The highest-scoring applicants in each area on the preliminary screening test were asked to take the preliminary selection test in the area or areas in which they had obtained outstanding scores. In all, 80 applicants were retested in one or more fields. The numbers of cases available in the five areas were not sufficient to warrant the computation of intercorrelations or reliability coefficients for the preliminary selection tests.

The names of the eighty applicants who were retested were arranged in rank order of score in each of the five areas. Since there were places available in the Elementary School for only 30 of them, the top- scoring six children in each area were noted. If one of these children was included in more than one of the five lists, he was left in the area in which he ranked highest and deleted from any other list. The seventh-ranking child in the latter was then moved up to fill the quota, etc. In addition to the names of six children in each area, the names of two alternates in each were included in the list of names submitted to the Elementary School for admission.

This list was not accepted without substantial change. The Elementary School required that half of the six children in each area be boys and half girls, that children who had taken the Stanford-Binet Scales prior to the Preliminary Selection tests be dropped, and that children could be admitted only if they obtained satisfactory ratings on their social and personality characteristics as evidenced during small-group interviews conducted by teachers and the principal of the school. These requirements caused considerable change in the list and made it necessary to dip down into the rank order for children whose test scores were markedly lower than those originally suggested.

The requirement of equal numbers of boys and girls in each area was especially disturbing because the children scoring highest tended to be predominantly boys. That this tendency may reflect true sex differences is indicated by the data in tables 6 and 7. In an entirely different sample of 110 children tested with Forms AX and BX of the Hunter Aptitude Scales for Gifted Children 23 out of the 37 children identified as the most gifted in one or more of the five areas were boys even though 59 of the 110 children were girls and 51 were boys. Thus, 62 per cent of the 37 most gifted

children were boys whereas, if talent were distributed equally between boys and girls, 46 per cent would most likely have been boys.

Other alterations in the list were caused by last- minute withdrawals. After the class got under way in September 1958, two additional children were withdrawn mainly because they proved to be too immature to participate in the activities of the class. This development points to the need for developing means of judging social and emotional maturity more effective than the small- group interview technique that was employed. The characteristics and classroom behavior of the 27 children who were present in the experimental class throughout the academic year 1958-1959 are described in section II.

Hunter Aptitude Scales for Gifted Children

Experimental Forms AX and BX

Information obtained from the administration of the preliminary screening and selection tests was used in constructing two parallel forms of much longer tests in each of the five areas selected for measurement. These tests constitute the experimental forms for two parallel forms of the Hunter Aptitude Scales for Gifted Children. As in the case of the preliminary tests, these tests are administered individually and require no reading or writing on the part of the examinee. The types of items and the numbers of scorable exercises in each of the experimental forms AX and BX are as follows:

Space	65
Object Completion	
Perspective	
Hidden Pictures	
Cubes	
Roll-up	
Jigsaw puzzles	
Judging sizes	
Estimating Path	
Number	65
Addition	
Subtraction	
Multiplication	
Division	
Reasoning	53
Picture analogies	
Verbal analogies	
Picture arrangement	
Planning (Jump Peg)	
Science	50

Vocabulary	97
Picture recognition	
Definitions	
TOTAL	330

Form AX was administered in the spring of 1958 to 57 applicants and form BX to 53 applicants for admission to the first-grade of Hunter College Elementary School. All of the applicants were born in 1954; 51 were boys and 59 girls. The tests were given in three sessions for each applicant by one of two examiners employed for the purpose. All items were unspeeded.

The reliability coefficients and intercorrelations of the five tests were obtained separately for Form AX and Form BX. When these were found to be insignificantly different at the .05 level, data for the two forms were combined to obtain the within-groups standard deviations and reliability coefficients shown in table 3. The data conform to expectations except for the reliability coefficient of the Space test, which is lower than desired. The 85% confidence interval for an obtained score is 7.52, which is about one-fifth of the range of points actually scored or about one-fourteenth of the total possible score.

In table 4 the intercorrelationsof the five tests in each form are shown after correction for attenuation. It should be noted that the correlation of the number and reasoning scores is only .34. Some of the implications of the data in table 4 are made explicit in table 5 which shows the per cent of the nonchance variance of each test that is estimated to be unique in the Hunter Aptitude Scales for Gifted Children. Information of this sort has rarely been provided for aptitude batteries; if it were, very few tests would be found to yield as much nonchance unique variance as do these.

To show plainly in nonstatistical form the practical utility of the Hunter Aptitude Scales for Gifted Children in selecting gifted children of diverse types, tables 6 and 7 have been prepared. In table 6 are shown the names of the children identified by Form AX as the most gifted of 57 applicants for admission to the Hunter College Elementary School. (All names have been altered to prevent identification of examinees.) If the five tests all measured the same mental functions with perfect reliability, only seven different children would be identified as gifted. However, since the tests do not measure the same mental functions and since some children are gifted in one or more mental skills but not in others, this does not occur. Actually, 20 children are identified as gifted, of whom 11 are boys. Only two children out of 57 are in the top

TABLE 3

WITHIN-GROUP INTERCORRELATIONS AND RELIABILITY COEFFICIENTS[a] OF TESTS OF 5 DIFFERENT MENTAL CHARACTERISTICS IN FORMS AX AND BX OF THE HUNTER APTITUDE SCALES FOR GIFTED CHILDREN[b] BASED ON A SAMPLE OF 110 APPLICANTS FOR ADMISSION TO HUNTER COLLEGE ELEMENTARY SCHOOL BETWEEN AGES OF 4 YEARS AND 3 MONTHS AND 5 YEARS AND 3 MONTHS[c]

	Space	Vocabulary	Number	Reasoning	Science
Space	.69	.43	.31	.56	.54
Vocabulary		.93	.33	.45	.64
Number			.97	.32	.29
Reasoning				.94	.45
Science					.79
Mean	24.96	35.16	5.56	46.64	17.17
S D	5.89	10.89	8.82	17.11	5.73

[a] Reliability coefficients are in the diagonal cells. These are split-half coefficients corrected by Angoff's formula no. 16 (Angoff, 1953). The tests were not speeded; every examinee had a chance to try every item.

[b] These tests were constructed in the Hunter College Educational Clinic by Frederick B. Davis and Gordon Fifer, assisted by Arthur Appel, Gerald S. Lesser, Lucille Nahemow, and Mary B. Willis.

[c] The coefficients reported are based on administration of <u>one</u> form of the tests to each applicant, <u>not</u> on administration of both forms of the tests to any one applicant.

TABLE 4

WITHIN-GROUP INTERCORRELATIONS IN TABLE 3 CORRECTED FOR ATTENUATION
(N =110)

	Vocabulary	Number	Reasoning	Science
Space	.54	.38	.70	.73
Vocabulary		.35	.48	.74
Number			.34	.33
Reasoning				.52

TABLE 5

UNIQUE NONCHANCE VARIANCE OF EACH ONE OF 5 TESTS OF DIFFERENT MENTAL CHARACTERISTICS IN FORMS AX AND BX OF THE HUNTER APTITUDE SCALES FOR GIFTED CHILDREN

Test	Percent of Test Nonchance Variance Estimated to Be Unique
Space	31
Vocabulary	42
Number	82
Reasoning	48
Science	29

TABLE 6

SEVEN CHILDREN OUT OF 57 SCORING HIGHEST ON TESTS OF 5 DIFFERENT MENTAL CHARACTERISTICS IN FORM AX OF THE HUNTER APTITUDE SCALES FOR GIFTED CHILDREN

Space	Vocabulary	Number	Reasoning	Science
Donald	John	Alice	Alice	Axel
Paul	Susanna	Judy	Paul	John
Alice	Lona	Melvin	Judy	Paul
Janet	Mack	Paul	Mack	Phil
Karen	Melvin	Sally	Donald	Donald
Gary	Lynn	Dick	Karen	Saul
Bruce	Alice	John	Clara	Bruce

No. of Tests in Which Child Is in Highest Seven	Names	No. of Children
1	Janet, Gary, Susanna, Lynn, Sally, Dick, Clara, Phil, Saul, Lona , Axel	11
2	Karen, Bruce, Mack, Melvin, Judy,	5
3	Donald, John	2
4	Alice, Paul	2
		20

TABLE 7

SEVEN CHILDREN OUT OF 53 SCORING HIGHEST ON TESTS OF 5 DIFFERENT MENTAL CHARACTERISTICS IN FORM BX OF THE HUNTER APTITUDE SCALES FOR GIFTED CHILDREN

Space	Vocabulary	Number	Reasoning	Science
Woody	Charles	Lambert	Lana	Fred
Lambert	Fred	Marie	Katy	Mack
Lana	Albert	Daniel	Mack	Daniel
Derwood	Hobart	Katy	Woody	Lana
Fred	Lambert	Elisa	Hobart	Hobart
Jill	Lana	Jackson	Charles	Charles
Sam	Marvin	Hobart	Derwood	Albert

No. of Tests in Which Child Is in Highest Seven	Names	No. of Children
1	Jill , Sam, Marvin, Marie Elisa, Jackson	6
2	Woody, Derwood, Daniel Katy, Mack, Albert	6
3	Lambert, Fred, Charles	3
4	Lana, Hobart	2
		17

seven on as many as four different tests while eleven are in the top seven on only one test.

Table 7 presents analogous data for 53 children tested with Form BK. Of these, seventeen were identified as gifted in one or more areas, twelve of them being boys. Again, only two are identified as gifted in as many as four areas.

Additional data pertaining to the intercorrelations and reliability coefficients of Forms AK and BK are presented in Tables 8 and 9. These coefficients are based on the scores obtained by 54 children in grade one in the Hunter College Elementary School who were tested in May and June of 1958. Included in the group was the class of 27 children selected in part on the basis of their scores on the preliminary screening and selection tests. The average intercorrelation of the five tests in this group is .34; in the group of 110 applicants for whom the data are reported in table 3 it is .44.

Final Forms A and B.

Responses made by the 110 applicants tested in the spring of 1958 to every item in Forms AK and BK were used to obtain item-analysis data for each item in these forms. A difficulty index for each item was expressed as the percent of the 110 pupils who responded correctly. The discrimination ability of each item was estimated by comparing the per cent of examinees responding correctly in the highest 27 per cent of the distribution of scores (on the test in which the item was included) with the percent responding correctly in the lowest 27 per cent.

On the basis of the item-analysis data, items were selected and edited to provide two parallel forms comprising items as follows:

Test	Number of Scorable Exercises
Space	60
Hidden figures	4
Judging size	5
Object recognition	7
Jigsaw puzzles	10
Estimating path	15
Roll-up figures	5
Cubes	10
Perspective	4

TABLE 8

WITHIN-GROUPS INTERCORRELATIONS AND RELIABILITY COEFFICIENTS[a] OF TESTS OF 5 DIFFERENT MENTAL CHARACTERISTICS IN FORMS AX AND BX OF THE HUNTER APTITUDE SCALES FOR GIFTED CHILDREN BASED ON A SAMPLE OF 54 CHILDREN BETWEEN AGES OF 5 YEARS AND 5 MONTHS AND 6 YEARS AND 5 MONTHS IN HUNTER COLLEGE ELEMENTARY SCHOOL

	Space	Vocabulary	Number	Reasoning	Science
Space	.66	-.01	.28	.52	.16
Vocabulary		.88	.27	.15	.72
Number			.97	.47	.29
Reasoning				.72	.38
Science					.78
Mean	32.59	52.57	30.80	69.30	27.07
S D	5.18	9.92	13.38	9.16	5.77

[a] Reliability coefficients are in the diagonal cells. See footnote a to Table 1 for description of coefficients.

TABLE 9

WITHIN-GROUPS INTERCORRELATIONS OF
TABLE 8 CORRECTED FOR ATTENUATION
(N =54)

	Vocabulary	Number	Reasoning	Science
Space	-.01	.35	.76	.22
Vocabulary		.29	.19	.87
Number			.56	.33
Reasoning				.50

Test	Number of Scorable Exercises
Vocabulary	60
Picture recognition	10
Definitions	50
Number	60
Enumeration	10
Addition	15
Subtraction	15
Multiplication	10
Division	10
Reasoning	60
Picture analogies	20
Verbal analogies	20
Picture arrangement	10
Jump peg	10
Science information	50

These items (without the materials used in administering them) are presented in appendix B. It is believed that these revised tests will be at least as reliable as Forms AX and BX, will have better distribution characteristics, and will be more efficient measuring instruments.

It should be pointed out that Forms A and B of the Hunter Aptitude Scales are unique in many respects. First, they yield scores of high accuracy for children in the top 5 per cent of the American population between the ages of 5 and 8. Second, they are useful in the differential identification of children gifted in five important intellectual areas. Third, a composite score derived from them is more reliable than that derived from any other individually administered test for gifted children that is available.

The next step should be to obtain meaningful norms for the scores derived from these tests.

Conclusions

At this point the answers to two of the questions posed at the beginning of this section are evident. First, it is clear that there are at least five intellectual

abilities that are only loosely related to one another but which can be accurately measured in gifted children as young as 4-5 years of age. Second, children gifted in only one or in more than one of these intellectual abilities can be identified. Differences as small as .6 between standard scores in two separate tests can be shown to be significant at the .05 level of confidence when either Form A or B is used.

Data to answer the third question posed at the beginning of this section regarding the observable differences in the classroom among children gifted in several different intellectual characteristics are provided in section II.

SECTION II

CLASSROOM BEHAVIOR AND PERFORMANCE OF TWO FIRST-GRADE CLASSES IN HUNTER COLLEGE ELEMENTARY SCHOOL

Introduction

As soon as classes were assembled in the fall of the school year 1958-1959, all children in both the experimental (N=27) and control (N=26) classes were given the SRA Primary Mental Abilities Test (5-7 years) in the Spatial, Verbal, and Numerical areas, and the Hunter preliminary selection tests in Reasoning and Science (unless a child had previously taken the latter two as part of the preliminary selection procedures during the previous spring). The resulting scores provided an initial basis for comparison of the experimental and control classes in five areas (using somewhat more reliable instruments than the short preliminary screening tests) and for comparison of the groups within the experimental class. Table 10 presents these means.

It is clear that the two classes were rather comparable in all areas except Science, in which the experimental class was significantly higher. This may have been due in part to the fact that the Stanford-Binet, the selection device for the control group, does not emphasize science.

Experimental Teaching Program

The usual program for gifted children provided at the Hunter College Elementary School was supplemented with programs of special emphasis in the five areas, for high standing in which the experimental class was selected. It was hypothesized that such special programs would increase general participation and productivity in these areas, and that children gifted in a given area would benefit especially from instruction in that area. The normal daily program at the school called for a three-hour morning session for the entire class plus lunch and an additional hour for a different small group each day of the week. For the experimental class this hour was devoted to the special programs. The five or six members of each group met together on one afternoon each week.

In order to compare the effect of the special instruction in one area on the children gifted in that area with its effect on children gifted in other areas, the

TABLE 10

MEAN SCORES OF EXPERIMENTAL AND CONTROL CLASSES IN TESTS OF 5 MENTAL CHARACTERISTICS

Groups	N	PMA Space[c]	PMA Verbal[c]	PMA Quantitative[c]	Preliminary Selection Reasoning[b]	Preliminary Selection Science[b]
Experimental						
Space	6	19.16	37.50	17.17	14.33	11.83
Vocabulary	5	14.83	37.50	18.33	14.16	12.17
Number	5	17.60	41.60	22.80	16.20	12.70
Reasoning	5	17.20	40.20	22.00	16.80	17.50
Science	6	16.00	39.00	18.00	14.40	16.50
Total	27	16.67	39.04	19.52	14.85	13.85
Control	26	15.46	37.27	19.42	14.15	11.42
$t_{T.C.}$		1.02	1.57	.10	.79	2.28[a]

[a] $p < .05$ (two - tailed test)

[b] Of the 27 experimental children, seven received the Preliminary Selection Reasoning test in June 1958, twenty in September, 1958; nine received the Preliminary Selection Reasoning test in June 1958, eighteen in September 1958. Of the 26 control children, one received the Preliminary Selection Reasoning test in June 1958, twenty-five in September 1958; all control children received the Preliminary Selection Science test in September, 1958.

[c] All experimental and control children received the SRA Primary Mental Abilities Test for Ages 5 - in September, 1958.

school year was divided into quarters. Each group received special training in its area for half the afternoon period over the entire year. During the other half of the period each group received instruction in a different area each quarter. Thus, all children had an identical quarter of instruction in every area. Table 11 shows the schedule. The time of presentation of the comparable material was kept as constant as possible. The order was determined by the expected amount of exposure to material in an area during the regular morning program. For example, it was expected that a great deal of verbal material would be presented during the regular school day so the special instruction in that area was given to all groups first. Numerical was put second for the same reason, but, as it turned out, relatively little number work was done in this class.

The morning program was left entirely to the classroom teachers on the assumption that the experimental and control classes would be given similar material following a more or less standard pattern for the school. This proved not to be the case, which makes assessment of the effect of the special instruction less clear and comparison of observational material obtained on the two classes more difficult. The experimental class was conducted very informally with spontaneous participation encouraged; any ideas presented were followed up. The subject under discussion could change a number of times in a 15-minute period. The control class, on the other hand, was handled in a more traditional manner with a period assigned to a particular subject. The children were required to raise their hands and be recognized. These differences limit the conclusions that can be drawn from a comparison of the two classes.

The special programs for the experimental class were designed to provide a broader coverage than the morning program in the case of the Verbal and Numerical areas and to introduce material not generally taught at this age level—laboratory science and the rudiments of formal logic; for example, the Spatial work consisted in part of making maps and diagramatic representations, construction of designs, following diagrams, laying out a city, and Japanese paper folding.

Illustrations of activities in the Verbal area are free association to poetry with a chance to create poems; discussion of the dictionary and classes of words, vocabulary building, and the construction of dictionaries; development of a story; and practice in the communication of ideas. In the Numerical area, the program included familiarization with geometric figures and the concept of fractions, discussion of averages and the combination of numbers to balance groups, discussion of Roman numerals, making clocks and telling time and the use of an abacus. Included in the Reasoning

TABLE 11

SCHEDULE OF QUARTERS OF SPECIAL INSTRUCTION IN EXPERIMENTAL CLASS

	Quarter			
Group	1	2	3	4
Spatial	Spatial + Verbal	Spatial + Numerical	Spatial + Science	Spatial + Reasoning
Verbal	Verbal + Numerical	Verbal + Science	Verbal + Reasoning	Verbal + Spatial
Numerical	Numerical + Verbal	Numerical + Science	Numerical + Reasoning	Numerical + Spatial
Reasoning	Reasoning + Verbal	Reasoning + Numerical	Reasoning + Science	Reasoning + Spatial
Science	Science + Verbal	Science + Numerical	Science + Reasoning	Science + Spatial

lessons were verbal and pictorial analogies and similarities, some aspects of formal logic and the use of symbols to express ideas, and picture interpretation. In Science, the group had demonstrations and performed simple experiments dealing with air, air pressure, and air currents. Many of these activities the classroom teacher had never carried on previously and were experimental. Nevertheless, most of them seemed suitable to the group and were mastered by at least a part of the group.

Data Obtained

1. Achievement tests: A set of five were constructed to measure the amount of learning that had taken place in that quarter of special instruction in each area which all the groups received. The appropriate test was administered to each experimental group at the completion of each quarter.

2. Observational data: An observation code covering all relevant activities of the children was worked out. This is presented in Table 12. Each class was observed during the morning hours for two 45-minute periods each week. These periods were arranged so that all types of classroom activities were observed.

During the first term, two observers made ratings independently, one of whom was unaware of the test scores or the group assignment of any child. Unfortunately, one observer was unavailable for the second term. The degree of rank-order agreement between ratings of the two observers is expressed by the following correlation coefficients between their ratings: Spatial area, .79; Verbal area, .88; Numerical area, .70; Reasoning area, .78; and Science area, .97. This reasonably high agreement suggests that the observations were not biased by knowledge of each child's areas of special ability. In addition, when rater differences occurred, there was no consistent bias in favor of the expectations of the observer who had such knowledge.

Every afternoon session of the experimental class was attended by one observer. The second observer could not attend afternoon sessions without learning the group assignments of the children.

3. PMA: At the end of the year the SRA Primary Mental Abilities test (7-11 years) was administered to both classes. This form provides Spatial, Verbal, Numerical, and Reasoning scores. Only the non-reading part of the Verbal section of the PMA was used.

4. Experimental forms AX and BX of the Hunter Aptitude Scales for Gifted Children were administered in both classes.

TABLE 12

CODE FOR OBSERVATIONS

Sp, Ve, Mu, Re, Sc: Used to designate area

C: Responded when called on but didn't volunteer

V: Volunteered answer to a question

E: Volunteered a relevant comment not in response to question of teacher

U: Made a response well above general class level

Capital letter for major or central idea

Lower case letter for minor idea

\- For incorrect response

O for failure to respond when called on

r For repeating another's response

F For attention to or following, written or oval demonstration of teacher.

Results

There are two general comparisons to be made: first, the comparison of the groups within the experimental class with respect to the various measures, and second, the comparison, insofar as that is feasible, of the two classes. The first will answer the question "Did the selection tests identify children who would benefit especially from specialized instruction?" The second will indicate how this method of selection and instruction compares with more traditional ones.

In dealing with the experimental class two general kinds of analyses were made. First, the group means were compared. But since, as the earlier discussion pointed out, there was a great deal of overlap in the groups, so that a child in a given group would be expected on the basis of his selection test score in another area to do well in that area too, correlations between selection and performance scores were also computed in some instances. These data are presented in the tables that follow. Since all the analyses are based on small numbers, elaborate tests of significance were not attempted and it is well to consider the findings as suggestive rather than conclusive.

Table 13 presents data relating the achievement tests to the selection procedures. In all but the science group the expected mean is the highest and, in addition, the appropriate group mean is significantly higher than that for the remainder of the class.

Tables 14 through 18 show the effects of the special instruction on children identified as gifted in each of five mental characteristics. If satisfactory reliability coefficients had been available for the tests given before and after the special-lesson periods, estimated true relative changes would have been calculated instead of the relative changes shown in each table in column 6. In any event considerable caution is required in interpreting these relative changes because some of the tests used before and after the special lessons were rather short and unreliable; difference scores involving them are even more unreliable than the original scores.

It was hypothesized that special instruction in a given area would cause greater learning among the children identified as gifted in that area than among the other children in the experimental class. Table 14 indicates that the children gifted in space aptitude did gain more than the average of the class after exposure to the special lessons in space. The children gifted in science aptitude gained slightly more. The data in table 15 suggest that the children gifted in verbal aptitude gained considerably more than the average of the class with respect to verbal knowledge. The effect of special numerical lessons, as shown in table 16, was to produce a much greater-

TABLE 13

ACHIEVEMENT TEST MEANS FOR THE FIVE GROUPS IN EXPERIMENTAL CLASS

Group	N	Spatial	Verbal	Numerical	Reasoning	Science
Spatial	6	8.50	8.25	4.33	11.50	5.58
Verbal	6	6.50	9.75	2.00	11.66	6.08
Numerical	5	7.80	8.50	6.60	13.00	5.60
Reasoning	5	7.20	8.80	3.60	14.20	8.12
Science	5	6.60	8.10	2.40	13.00	6.70
t group vs. remainder		2.34[a]	2.93[a]	3.05[a]	2.24[a]	.76

[a] $p < .05$

TABLE 14

RELATIVE EFFECT OF SPECIAL SPATIAL LESSONS[a] ON THE AVERAGE SCORES OF CHILDREN SELECTED AS GIFTED IN EACH ONE OF THE FIVE AREAS

Col.	1	2	3	4	5	6
Group	N	Raw Score Space Achievement	Space Achievement Standard Score	PMA Space Sept. 1958	PMA Space Standard Score	Relative Change: Col.3- Col.5
Space	6	8.50	+.75	18.83	+.48	+.27
Vocabulary	6	6.50	-.53	14.83	-.41	-.12
Number	5	7.80	+.30	19.60	+.65	-.35
Reasoning	5	7.20	-.08	17.20	+.12	-.20
Science	5	6.60	-.47	12.80	-.86	+.39
Total	27	7.33	0.00	16.67	0.00	0.00

[a] Each one of the five groups had the same special one-half-hour spatial lessons, one per week for seven weeks.

TABLE 15

RELATIVE EFFECT OF SPECIAL VERBAL LESSONS[a] ON THE AVERAGE SCORES OF CHILDREN SELECTED AS GIFTED IN EACH ONE OF FIVE AREAS

Col.	1	2	3	4	5	6
Group	N	Raw Score Verbal Achievement Dec.1958	Verbal Achievement Standard Score	PMA Verbal Sept. 1958	PMA Verbal Standard Score	Relative Change: Col.3-Col.5
Space	6	8.25	-.23	37.50	-.42	+.19
Vocabulary	6	9.75	+.55	37.50	-.42	+.97
Number	5	8.50	-.10	41.60	+.70	-.90
Reasoning	5	8.80	+.05	40.20	+.32	-.27
Science	5	8.10	-.31	39.00	-.01	-.30
Total	27	8.70	0.00	39.04	0.00	0.00

[a] Each one of the five groups had the same special one-half-hour verbal lessons, one per week for seven weeks.

TABLE 16

RELATIVE EFFECT OF SPECIAL NUMERICAL LESSONS[a] ON THE AVERAGE SCORES OF CHILDREN SELECTED AS GIFTED IN EACH ONE OF FIVE AREAS

Col.	1	2	3	4	5	6
Group	N	Raw Score Number Achievement	Number Achievement Standard Score	PMA Number Sept 1958	PMA Number Standard Score	Relative Change: Col.3-Col.5
Space	6	4.33	+.20	17.17	-.58	+.78
Vocabulary	6	2.00	-.60	18.33	-.30	-.30
Number	5	6.60	+.99	22.80	+.81	+.18
Reasoning	5	3.60	-.05	22.00	+.62	-.67
Science	5	2.40	-.47	18.00	-.38	-.09
Total	27	3.74	0.00	19.52	0.00	0.00

[a] Each one of the five groups had the same special one-half-hour number lessons, one per week for seven weeks.

than-average gain for the children gifted in space aptitude and a slightly greater-average gain for the children gifted in number aptitude. Table 17 shows that the special reasoning lessons were followed by greater-than-average gains in reasoning performance among children gifted in the science and reasoning areas. The data in table 18 show that the special lessons in science led to poorer relative performance on the part of children gifted in science aptitude. This was also true for children gifted in number aptitude. The greatest relative gain was made by children gifted in the verbal area.

In general, the relative changes were not large and not consistently as hypothesized. This is not surprising since the number of hours of special teaching was small and the measuring instruments employed were somewhat crude. Without satisfactory reliability coefficients in the groups tested and the correlations of scores on the tests used before and after the special lessons, precise evaluation of the data is not possible.

The observational material obtained in the morning sessions was divided into quarters to correspond with the special afternoon programs in order to check for trends and to see if there was any evidence that a particular afternoon program was influencing performance in the general classroom situation. Analyses were made of total number of correct responses made, number of major responses, number of volunteered as as opposed to called-on responses, and number of appropriate responses made in a context other than the area of the response (e.g., a relevant numerical response to a spatial discussion). Unusual responses, errors, failures to respond, etc., occurred too infrequently for statistical treatment. All of the categories yielded similar results so only one set, that for major responses, will be presented, plus a combined table for responses in other contexts. To help control for differences in willingness to talk and assertiveness among the children, and to take into account the differences in numbers of responses in the areas, a chi-square analysis was used with obtained frequencies compared with expected based on the marginal totals. Tables 19, 20, 21, and 22 present the frequencies of major responses of all groups in all categories. Table 23 presents the frequencies of appropriate responses made in a context other than the area of the response (e.g., a relevant numerical response in a spatial context). The chi-square values listed are for 2 x 2 tables; i.e., responses in the appropriate area versus all other responses.

These tables show that the groups, except for the Reasoning group, consistently make more responses in their areas than would be expected by chance. There seems to be

TABLE 17

RELATIVE EFFECT OF SPECIAL REASONING LESSONS[a] ON THE AVERAGE SCORES OF CHILDREN SELECTED AS GIFTED IN EACH ONE OF FIVE AREAS

Col.	1	2	3	4	5	
Group	N	Raw Score Reasoning Achievement	Reasoning Achievement Standard Score	Raw Score Reasoning Prelim. Selection	Reasoning Standard Score	Relative Change: Col.3- Col.5
Space	6	11.50	-.57	14.33	-.26	-.31
Vocabulary	6	11.67	-.48	14.17	-.32	-.16
Number	5	13.00	+.21	16.30	+.37	-.16
Reasoning	5	14.20	+.84	16.90	+.56	+.28
Science	5	13.00	+.21	14.40	-.24	+.45
Total	27	12.59	0.00	15.15	0.00	0.00

[a] Each one of the five groups had the same special one-half-hour reasoning lessons, one per week for seven weeks.

TABLE 18

RELATIVE EFFECT OF SPECIAL SCIENCE LESSONS[a] ON THE AVERAGE SCORES OF CHILDREN SELECTED AS GIFTED IN EACH ONE OF FIVE AREAS

Col.	1	2	3	4	5	6
Group	N	Raw Score Science Achievement	Science Achievement Standard Score	Raw Score Science Prelim. Selection	Science Prelim. Selection Standard Score	Relative Change: Col.3- Col.5
Space	6	5.58	-.47	11.83	-.58	+.11
Vocabulary	6	6.08	-.15	12.17	-.48	+.33
Number	5	5.60	-.46	12.70	-.33	-.13
Reasoning	4	8.13	+1.17	17.50	+1.04	+.13
Science	5	6.70	+.25	16.50	+.75	-.50
Total	26	6.31	0.00	13.85	0.00	0.00

[a] Each one of the five groups had the same special one-half-hour science lessons, one per week for seven weeks.

TABLE 19

MAJOR RESPONSES IN ALL AREAS BY ALL GROUPS IN THE EXPERIMENTAL CLASS DURING THE FIRST-QUARTER MORNING SESSIONS

		Area					
Group	N	Spatial	Verbal	Numerical	Reasoning	Science	Total
Spatial	6	22	18	1	14	6	61
Verbal	6	10	19	4	9	9	51
Numerical	5	9	13	9	3	6	40
Reasoning	5	9	24	5	15	19	72
Science	5	8	10	0	4	29	51
Total	27	58	84	17	45	69	275

Chi-Square Values for 2 X 2 Tables[a]

Spatial = 9.09[b]
Verbal = .70
Numerical = 12.93[b]
Reasoning = .85
Science = 30.50[b]

[a] Yates Correction applied

[b] $p < .05$

TABLE 20

MAJOR RESPONSES IN ALL AREAS BY ALL GROUPS IN EXPERIMENTAL CLASS DURING SECOND-QUARTER MORNING SESSIONS

		Area					
Group	N	Spatial	Verbal	Numerical	Reasoning	Science	Total
Spatial	6	14	23	1	6	7	51
Verbal	6	9	43	4	11	9	76
Numerical	5	3	23	9	8	4	47
Reasoning	5	8	25	2	11	11	57
Science	5	4	17	0	9	19	49
Total	27	38	131	16	45	50	280

Chi - Square Values for 2 X 2 Tables [a]

Spatial	8.85[b]
Verbal	4.03[b]
Numerical	16.00[b]
Reasoning	.30
Science	16.03[b]

[a] Yates Correction applied

[b] $p < .05$

TABLE 21

MAJOR RESPONSES IN ALL AREAS BY ALL GROUPS IN THE EXPERIMENTAL CLASS DURING THE THIRD-QUARTER MORNING SESSIONS

		Area					
Group	N	Spatial	Verbal	Numerical	Reasoning	Science	Total
Spatial	6	10	45	20	5	17	97
Verbal	6	4	68	20	7	19	118
Numerical	5	2	52	45	6	16	121
Reasoning	5	0	27	12	7	16	62
Science	5	2	30	10	2	19	63
Total	27	18	222	107	27	87	461

Chi - Square Values for 2 X 2 Tables [a]

Spatial = 24.91[b]
Verbal = 5.52[b]
Numerical = 18.19[b]
Reasoning = 1.96
Science = 5.85[b]

[a] Yates Correction applied

[b] $p < .05$

TABLE 22

MAJOR RESPONSES IN ALL AREAS BY ALL GROUPS IN THE EXPERIMENTAL CLASS DURING THE FOURTH-QUARTER MORNING SESSIONS

		Area					
Group	N	Spatial	Verbal	Numerical	Reasoning	Science	Total
Spatial	6	23	16	25	10	13	87
Verbal	6	7	25	7	6	14	59
Numerical	5	4	24	30	3	12	73
Reasoning	5	6	15	16	7	4	48
Science	5	8	6	11	2	16	43
Total	27	48	86	89	28	59	310

Chi - Square Values for 2 X 2 Tables[a]

Spatial - 11.07[b]

Verbal - 8.55[b]

Numerical - 7.08[b]

Reasoning - 1.98

Science - 10.00[b]

[a] Yates Correction applied

[b] $p < .05$

TABLE 28

RESPONSES IN ALL AREAS MADE IN OTHER CONTEXTS BY ALL GROUPS IN EXPERIMENTAL CLASS DURING FIRST AND SECOND-QUARTER MORNING SESSIONS

		Area					
Group	N	Spatial	Verbal	Numerical	Reasoning	Science	Total
Spatial	6	13	49	3	19	10	94
Verbal	6	7	72	8	23	14	124
Numerical	5	5	39	13	13	6	76
Reasoning	5	7	59	10	20	29	125
Science	5	4	29	1	12	36	82
Total	27	36	248	35	87	95	501

Chi - Square Values for 2 X 2 Tables [a]

Spatial - 5.71[b]

Verbal - 5.16[b]

Numerical - 9.10[b]

Reasoning - .30

Science - 37.89[b]

[a] Yates Correction applied

[b] $p < .05$

no clear evidence that a particular special program has an immediate influence on total general productivity, although over the long term there was a relative increase in numerical responses, and science responses occurred most frequently and were distributed most evenly in the third quarter when all groups had had or were having the special science program. Reasoning responses, on the other hand, decreased in frequency at the time that the special reasoning lessons were being given. It is also clear that the third quarter was the one of greatest productivity. The drop in the fourth quarter may be a result of the teacher's slowing down of the pace as the end of the year approached.

The contributions of the groups in the five special afternoon programs for the experimental class were recorded in the same way as those in the morning. The analysis was confined to the quarters in which all groups had comparable instruction. Since in these small groups all had equal opportunity to contribute and were called on if they failed to volunteer, only the mean number of responses per group was used. Table 24 presents for each area the mean number of major responses as well as the significance ratio for the difference between the group mean and that for the rest of the class. Here again the selected groups tended to do significantly better than the remainder of the class as a group. But again, in most cases the Reasoning group was doing nearly as well. The amount of material from other areas introduced into the special instruction periods was also analyzed by groups and this material is presented in Table 25. There seems to be a tendency for the children to want to discuss "their" subjects even when the structure of the situation doesn't favor it.

The mean Primary Mental Abilities (7-11) scores in the four areas the test measures are given in Table 26. Again we find the selected groups tending to do better than the class as a whole. In this case the Verbal group does not appear to be significantly above the rest of the class, but we pointed out earlier that our selection test in that area apparently measured something different from the PMA. Here, also, the Reasoning group, in contrast to some of the observational data but consistent with the learning-test results, scored significantly above the rest of the group in that area. A possible explanation is that these children can perform well on a test or in a small group when they are called on frequently but are somewhat withdrawn in a larger group. The table shows the spatial and numerical groups also doing well in reasoning. This is perhaps not surprising for the Numerical group. For Spatial group probably benefited by the fact that the reasoning score was based on the Figure Grouping portion of the test.

The mean scores for each group in the experimental class on Forms AX and BX of

TABLE 24

OBSERVATIONAL DATA MEANS FOR THE SPECIAL INSTRUCTION PROGRAMS FOR THE EXPERIMENTAL CLASS

		Area				
Group	N	Spatial	Verbal	Numerical	Reasoning	Science
Spatial	6	18.17	10.00	13.00	11.00	23.83
Verbal	6	7.00	25.83	8.83	12.00	23.50
Numerical	5	10.00	27.20	23.00	16.80	28.00
Reasoning	5	10.00	27.20	22.00	24.00	32.20
Science	5	9.80	16.00	12.00	13.80	35.80
Total	27	9.00	19.90	13.59	13.23	26.67
t group vs. remainder		4.85[a]	2.27	4.80[a]	4.22[a]	1.21

[a] $p < .05$

TABLE 25

MEAN NUMBER OF CONTRIBUTIONS IN A GIVEN AREA INTRODUCED INTO SPECIAL SESSIONS IN OTHER AREAS BY THE FIVE GROUPS IN THE EXPERIMENTAL CLASS

	Spatial Group	Others
Spatial Content by:	8.2	3.1

	Verbal Group	Others
Verbal Content by:	5.3	3.8

	Numerical Group	Others
Numerical Content by:	4.4	0.5

	Reasoning Group	Others
Reasoning Content by:	15.2	6.5

	Science Group	Others
Science Content by:	6.0	1.7

TABLE 26

MEAN SCORES IN FOUR AREAS FOR ALL GROUPS IN THE EXPERIMENTAL CLASS ON THE SRA PRIMARY MENTAL ABILITIES TEST FOR AGES 7 - 11

Group	N	Spatial	Verbal	Numerical	Reasoning
Spatial	6	18.00	14.16	6.00	17.36
Verbal	6	11.36	16.60	2.36	11.60
Numerical	5	16.60	15.40	15.60	17.60
Reasoning	5	15.40	16.20	4.80	16.80
Science	5	11.40	14.60	3.00	12.60
Total	27	13.57	15.00	6.19	15.28
t group vs. remainder		2.43[a]	.49	[a,b]	3.00[a]

[a] $p < .05$

[b] This distribution was not normal so White's rank test (White, 1952) was used for evaluation

the Hunter Aptitude Scales for Gifted Children are presented in Table 27. Scores from both forms were converted to a common metric before the means were computed.

The means for each group in the experimental class on Forms AX and BX of the Hunter Aptitude Scales for Gifted Children are presented in Table 27. Approximately half of the class received Form AX and half Form BX. Since the mean raw scores differ to some extent for the two forms, scores on all tests in both forms were made comparable before the means presented in Table 27 were computed.

The groups in the experimental class maintained some superiority over the class as a whole in their areas but in no case was the score significantly higher. All of these results should be considered suggestive only, based as they are on a relatively small number of children. Some tentative conclusions are indicated, however. Although the children who were initially selected as gifted in an area tend to retain their superiority, there is no evidence that they benefited more by instruction in their areas than did the other children. In fact there is a suggestion of more rather than less overlap in test scores at the end of the year. The amount of classroom contributions in their given areas appears to be relatively constant throughout. This may reflect an interest factor added to the ability factor.

However, comparisons among aptitude groups on the four criterion measures employed (i.e., achievement tests, observational records, Primary Mental Abilities scores, and the experimental forms of the Hunter Aptitude Scales for Gifted Children) suggest a moderately successful degree of differentiation of children of diverse aptitudes through the Preliminary Screening and Preliminary Selection tests.

Subjective Impressions

One final comment about the groups in the experimental class. Although these are merely impressions of the observer and others who had dealings with the children and cannot be tested statistically at this time, there appeared to be very real behavioral differences between some of the groups. Particularly striking was the behavior of most of the children in the spatial group. As a group they were extremely kinetic and very exuberant with lively senses of humor. The question as to whether their constant exploration of their environment is related to spatial achievement came to mind. With one exception the numerical group, on the other hand, appeared rather somber and lacking in a sense of humor and very serious about the job to be done.

TABLE 27

MEAN COMPARABLE SCORES ON FORMS AX AND BX OF THE HUNTER APTITUDE SCALES FOR GIFTED CHILDREN IN THE 5 GROUPS OF EXPERIMENTAL CLASS

Group	N	Area				
		Space	Vocabulary	Number	Reasoning	Science
Space	6	59.0	58.0	59.1	59.4	59.0
Vocabulary	6	53.8	61.5	56.4	58.2	60.6
Number	5	56.2	56.6	64.2	61.3	60.1
Reasoning	5	59.9	61.3	58.0	58.2	60.5
Science	5	55.6	58.4	53.4	58.3	62.8
Total	27	57.0	59.3	58.0	58.8	60.5
t (underlined mean vs. remainder mean)		.97	2.27[a]	8.55[a]	.82	1.22

[a] $p < .05$ (two - tailed test). The denominator term in the t test was the population estimate of the standard error of measurement of the difference (not the standard error of the difference). Thus, p indicates the probability that the difference between the means of the two groups compared would occur as a chance deviation if the difference between the true means of these groups were zero.

One child cried on one occasion when,for some reason, the numerical lesson was postponed. The verbal group seemed generally anxious to please adults, suggesting the possibility that early development of communication skills is associated with this trait.

The groups also varied in the matter of interest and attention in the various special sessions. One child in the numerical group was able to grasp the principle of the see-saw at once and, when provided with the weights of the five children in the group, he assigned the correct two to each imaginary side and, correctly, said, "I guess I'll have to go in the middle." In the verbal group one child would only say, "I want to be on the same (again imaginary) side as Amy." In response to a reading of Robert Louis Stevenson's poem "Autumn Leaves" the verbal group made up it's own poem and the science group engaged in a discussion of mulch. There were numerous such incidents. Refined selection procedures which sharpen the differences between groups plus more carefully planned special programs could conceivably produce some striking results.

APPENDIX A

PRELIMINARY TESTS

Preliminary Screening Test

Spatial Items

Item	Expected Response	Score
"I'm going to show you some pictures that haven't been finished. See if you can tell me what this would be a picture of if it were finished." 1. (Show card S1)	Shoe	1
2. (Show card S2)	Bottle Rocket	1 1
3. (Show card S3	Shovel	1
4. (Show card S4) "Which of the shapes down below (pointing) has one more side than this one (pointing to the triangle)?"	B	1
5. (Give the child sheet with right angle on it) "Make this into a shape that is wider than it is high."	Any figure that is actually wider than high	1
6. (Show purple diamond and triangle) "How many of these would it take to make one of these?"	2	1
7. (Show yellow quarter circle) "How many of these will it take to make a circle?"	4	1
8. "About how many glasses of milk are there in a quart bottle of milk?"	3-8	1
9. (Show child large yellow triangle with base at bottom. Present the 4 small yellow pieces in the arrangement shown at right.) "Put these together so that they make a shape like this."		1
10. Show child two green squares and 13 tiny dolls. "Here are two green yards to play in. Put some of the babies in one yard and some in the other, so that each baby will have the same amount of space to play in." (Repeat second sentence while child is arranging dolls).	No. in larger sq. 8-10 No in smaller sq. 5-3	1

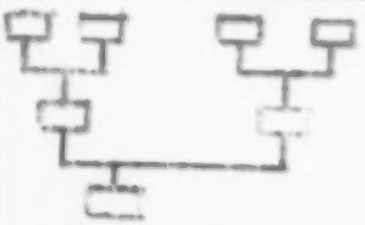
Spatial Items

Item	Expected Response	Score
11. (Show card S5) "How would this church look to the boy from where he is standing? This way, or this way, or this way, or this way (indicating)? How would it look to the boy?"	A	1
12. (Show card S6) "After these peanuts have been ground up to make peanut butter, will they take up more room, less room, or the same amount of room?"	Less	1
Verbal Items		
1. "Suppose you are talking to a little boy who has never been in the city and doesn't know what a subway is. How would you tell him what a subway is?"	1 pt for "train" idea 1 pt for "underground" idea	1 or 2
2. "Tell me all the words you can think of that mean the same as <u>little</u>."	1 pt for first synonym ½ pt for 2nd, 3rd "	1, 1½ or 2
3. "Tell me all the words you can think of that mean the same as <u>beautiful</u>."	Same as for no. 2	1, 1½, or 2
4. "What are instructions?"	"Tell you what to do" idea	1
5. "The integument of something is its covering. What part of an orange is its integument?"	peel, rind, skin	1
6. "Petrograd means Peter's city. Stalingrad means Stalin's city. What do you think <u>grad</u> means?"	city	1
7. "Is tomorrow the past, or the present, or the future?"	future	1
8. "Is an <u>instrument</u> a tool, or a lesson, or a song?"	tool, musical instrument	1
9. "Is your mother your relative, or your employee, or your customer?"	relative	1
10. "If something belongs to you, is it a diagram, or a possession, or a history?"	possession	1

Verbal Items

Item	Expected Response	Score
11. (Show card V1) "Which of these pictures shows things that overlap?"	C (root)	1
12. (Show card V2) "Finish this for me: "There are no hills and valleys in this country, so it is perfectly_____?"	Flat, level, smooth, even	1
Numerical Items		
1. "In the Jones family there are a father, a mother, and three children. How many people is that?"	5	1
2. (Show card N1) "If five of these birds flew away, how many would be left?	3	1
3. (Show card N2) "Here are six socks hanging on the line. How many pairs of socks would that be?" (If child says six, say) "Yes, but how many pairs of socks?"	3	1
4. "How many spaces are there between your five toes?"	4	1
5. "You have five fingers on each hand, and five toes on each foot. How many fingers and toes have you altogether?"	20	1
6 "What time is it at noon?"	12 o'clock	1
7. (Show card N3) "This can of tomato juice holds four pints. If you use half of it for breakfast, how many pints will be left in the can?"	2	1
8. (Show card N4) "This car has two spare tires in its trunk. Counting the tires on the wheels, how many tires has it altogether?"	6	1
9. (Show card N5) "The yellow apple costs 10 cents and the red one costs 5 cents. How much do both of these two apples cost?"	15 cents	1
10. "There are three biscuits for two children. If you divide the biscuits up equally, so that each child has the same amount, how many biscuits will each child have?...if you divide up three biscuits between two children?"	1½	1

Numerical Items

Item	Expected Response	Score
11. "You have three rabbits, but one of the rabbits has only one ear. How many ears are there on all of your rabbits together?"	5	1
12. "How many hours is it from seven o'clock in the morning to nine o'clock in the morning?"	2	1
Reasoning Items		
1. "A man's hand is like a dog's————what?"	paw, foot	1
2. "A sofa's cushion is like a bed's———what?"	pillow, mattress	1
3. (Show card L1) "A shovel is like a spoon in the same way that a pitchfork is like a———what?"	fork, table fork	1
4. (Show card L2) "There is the same amount of hot soup in each of these dishes. In which one will it cool off faster?" (If answer is B, ask) "Why?"	Answer- B Reason: "Air can reach it" idea	½ without reason 1 with reason
5. (Show card L3) "This boy is trying on shoes. The ones in size 6 are too small for him and the ones in size 8 are too large. What size should he buy?"	7	1
6. (Show card L4) "What do you think will happen after the man pushes the big rock off the cliff?"	Dog will go up	1
7. (Show card L5) "These are your grandparents (indicating top 4 blocks), these are your father and mother (indicating middle 2 blocks), and this is you (indicating bottom block). If you had a brother, where would he be?" (Indicate child's answer on chart)	 anywhere in last row	1
8. "If these things were arranged in the right order, which of them would come last? Getting sick. Going back to school. Staying in bed."	going back to school	1

Reasoning Items

Item	Expected Response	Score
9. "If these things were arranged in the right order, which one would come in the middle? Grandfather. Baby. Father."	Father	1
10. (Show card I6) "The pail has a leak in it. Will all the water leak out? (If answer is no, say) "Why not?"	Ans: No Reason: "water below hole will not" idea	2 without reason 1 with reason
11. (Show the child the three safety pins linked together and held in a straight line. Don't allow the child to handle the pins) "How many safety pins would you have to undo to get them all apart, separate from each other?	one --- 2 pts two --- 1 pt three --- 0 pts	1 - 2
12. (Show card I7) "These are footprints in the snow. Here are a man's footprints, and here are a boy's footprints (indicating). Who Walked along here first, the boy or the man? (If child says boy, ask) "How do you know?"	Ans: Boy Reason: "man's footprints on top"	½ without reason 1 with reason

Science Items

Item	Expected Response	Score
1. (Show card SC1) "This is a little bit of land in the middle of the ocean. What is it called?"	Island Rocks	1 ½
2. (Show card SC2) "Which thermometer says it is hot weather?" (If answer is A, say) "How can you tell?"	Ans: A Reason: "Mercury is higher" idea	½ without reason 1 with reason
3. "What do you find rust on?"	Metal (any specific item)	1
4. "If you tie something to a string and whirl it around your head, then let it go, will it fly away in a straight line or in a circle."	Straight	1
5. "Which of these is usually a gas: oxygen, or uranium, or boric acid?"	Oxygen	1
6. "Tell me some things that are sometimes solid and sometimes liquid."	water, ice, etc.	1
7. "What does a tadpole grow into?"	frog, toad, salamander	1

Science Items

Item	Expected Response	Score
8. "How often do we have a full moon? Once a week, or once a month, or once a year?	Once a month	1
9. "Why is it likely to be dark just before it rains?"	clouds	1
10. "How many legs does a bug, or an insect, have?"	6 (or more)	1
11. "When somebody says, "There's a lot of humidity today, what does he mean?"	dampness, water in air	1
12. (Show card SC3) "The children are sliding down the board. If they get a much longer board, will they slide down faster, or slower, or just as fast as they do now?"	slower	1

Preliminary Selection Tests

Spatial Items

Item	Expected Response	Score
1. (Show child incomplete picture of chair.) "I'm going to show you some pictures that haven't been finished yet, and I want you to tell me what they would be pictures of if they were finished. What would this be a picture of if it were finished?"	Chair	1
2. (Show child incomplete picture of TV set.) "What would this be a picture of if it were finished?"	TV Set	1
3. (Show child 60-degree yellow segments pasted on on cardboard.) "Show me how many of these pieces you would need, if you wanted to fit them together into a round circle."	5 - 7	1
4. (Show child picture of doll.) "Show me you left hand." If answer is correct, say, "Now show me the doll's left hand."	both child's left hand and doll's left hand indicated correctly.	1
5. (Show child hidden picture of rabbit .) "Which of these things up here (indicating) is hidden in the picture down below (indicating)?"	A	1
6. (Show child hidden picture of saucepan.) "Which of these three things up her (indicating) is hidden in the picture down below?(indicating)."	B	1
7. (Show child hidden picture of wagon.) "Which of these these three things up here (indicating) is hidden in the picture down below (indicating)?"	B	1
8. (Show child hidden picture of toy boat.) "Which of these three things up here (indicating) is hidden in the picture down below?(indicating)"	C	1
9. (Show child picture of children playing a circle game.) "The children are playing a circle game. See the boy in the red sweater. If the circle goes around three and a half times, this way (motioning clockwise), where will the boy in the red sweater be?"	any one of 3 top positions	1
10. (Show child card containing numbers.) "Which of these numbers would still be the same number, even if you turned it upside down?" If less than three answers are given, say, "Are there any others?"	3 right = 1 3 right and one wrong=1 3 right and two wrong =0 2 right and 0 wrong =1 2 right and 1 wrong =0	

Spatial Items

Items	Expected Response	Score
11. (Show child toy soldier mounted in box.) "Where will the soldier's bullet hit, here, or here, or here?" (Indicating the three dots, highest one first)."	C	1
12. (Present wooden pieces in this position: "Put these pieces together so that they make a circle, like this one (holding up the wooden circle.) You can turn the pieces any way you want to." (Do not lay the complete wooden circle down on the table.)		1
13. -16. (Hand child a pencil and mimeographed sheet of partly finished design.) "Finish this drawing for me."	proper pattern continued	1
17. (Hand child a pencil and incomplete drawing of box.) "Finish this so that it will make a drawing of a square box."	proper pattern continued	1
18. (Hand child the two separated parts of a pair of plastic kindergarten scissors.) "Show me how you would put these pieces together to make a pair of scissors."	correctly attaches scissors	1
19. (Show child two mismated and one properly mated pair of doll-shoes.) "Which of these is the best pair of doll-shoes?"	B	1
20. (Show child picture of pencil and box.) "You want to put the pencil into the box, but it is longer than the box is. What would you do?" If child says he would try it in the other direction(vertically on the picture), say, "But if that wouldn't work, and you wanted to put the pencil into the box, then what would you do?"	pencil inserted diagonally	1
21. (Show child a completed Christmas tree and hand him the two pieces of plastic or cardboard that one is made of.) "Put these two pieces together so that they will make a tree like this one." (Holding up the model tree.)	fits tree correctly	1
22. (Show child a completed toy lampshade, and three pieces of flat paper, one straight and two curved.)"Which of these pieces of paper would make a lampshade just like this, if you curved it around and pasted it together?" If child says, "either one of these," indicating two or three, count as wrong. Note answer and make child choose.	C	1

Spatial Items

Items	Expected Response	Score
23. (Show child picture of dog and tree.) "The dog started out here (pointing) and walked round and round the tree until he tied himself up close to it, like this (indicating.) Which drawing shows the way he went? This one, or this one, or this one? Which one shows the way he went?"	B	1
24. (Hand child four small cardboard triangles, and hold up large triangle.) "Put these four little triangles together so that they make one big triangle, like this one."		1
25. (Show child a pile of wooden blocks (15) and a bit of cardboard just large enough to be covered by two of them.) "If we want to cover this bit of cardboard with blocks, it takes just two of them (doing it.) Now show me how many blocks you would need to just cover this bit of cardboard (holding up the one that will require four.)" Except for the sample, do not lay the pieces of cardboard on the table.	4	1
26. "Now show me just how many blocks you would need to cover this bit of cardboard (holding up the one that will require three.)"	3	1
27. "Now show me just how many blocks you would need to cover this bit of cardboard." (Holding up the one that will require five.)	5	1
28. "Now show me just how many blocks you would need to cover this bit of cardboard (holding up the one that will require nine.)"	9	1
29. "A boy has walked half-way around a round pond, when his mother calls him to come back. How can he get back quickest?" If child indicates one route, say, "Would that be quicker than going the other way?"	either way	1
30. "Which of these shapes will stay exactly the same shape even if you cut a piece off the top of it?"	A	1

Verbal Items

Item	Expected Response	Score
1A. (Show child picture of two boys fighting.) "Robin and Reuben are having a conflict. What do you think the word "conflict" means?"	fight, fighting, boxing or any synonym	½
1B. (Show child picture of a zoo with a sign in front of the cage.) "The sign says "Do not disturb the animals." What does this mean?"	do not annoy do not bother	½
2A. (Show child a marble.) "Here is a marble. You could say that a marble is like a small ball, couldn't you? Now finish these sentences for me. A tack is like a small...."	nail	½
2B. "A cat is like a small...."	tiger or other large feline	½
3A. "A piece of string is like a small...."	piece of twine or rope or cord	½
3B. "A cart is like a small...."	wheelbarrow, wagon, truck, carriage, car	½
4A. "Finish this for me: Damp means a little bit...."	wet, water	½
4B "Finish this for me: Drowsy means a little bit...."	sleepy, lazy	½
5A. "Finish this for me: Warm means a little bit...."	hot, of hot and cold	½
5B. "Finish this for me: Cheerful means a little bit...."	happy, joyful	½
6A. Gregory is as different from Fritz as anyone could possibly be. Now finish this for me. Gregory is very tall but Fritz is very...."	short, little	½
6B. "Gregory is very rude, or very bad-mannered, but Fritz is very...."	kind, polite, good, nice, good - mannered	½
7A "Gregory is very handsome but Fritz is very..."	ugly, plain, homely	½
7B "Gregory is very wasteful but Fritz is very..."	thrifty	½
8A. "Finish this for me: A store where you can buy food to take home and cook is called a..."	A grocery store, supermarket, delicatessen or market, A and P, Foodstore, Vegetable store	½

Verbal Items

		Expected Response	Score
8B	"Finish this for me: A store where you can buy medicines and toilet articles is called a...."	drugstore, druggist	½
9A	"Finish this for me: A place where people go to stay when they are sick is called a...."	Hospital, Doctor's house	½
9B	"Finish this for me: A place where people who break the law are kept is called a...."	jail, prison, police station	½
10A	"Finish this for me: A building where they keep a great many books is called a...."	library, school	½
10B	"Finish this for me: A book which has a lot of maps in it is called an..."	atlas, gazetteer, cyclopedia	½
11A	"Finish this for me: If you can eat something it is eatable. If you can drink something, it is..."	drinkable	½
11B	"Finish this for me. A man that drives is called a driver. A man that trims is called a...."	trimmer	½
12A	"Finish this for me so that it rhymes: September, when the weather's cool, It's time for us to start to...."	school	½
12B	"Finish this for me so that it rhymes: The sun is up and shining bright. The dark has gone and now it's...."	light	½
13A	"'Re' means 'again.' What does 'rebuild' mean?"	build again or over	½
13B	"What does 'repaint' mean?"	paint again, over	½
14A	"'Un' means 'not.' What does "unfinished' mean?"	not finished, incomplete	½
14B	"What does 'unheated' mean?"	not heated, cold, cool	½
15A	"A dentist takes care of your teeth. Which of these Latin words do you think means tooth? Dens, mens, lux, or sol?" (Speak slowly and distinctly.)	dens	½

Verbal Items

	Expected Responses	Score
15B. "In Latin, 'fons' means fountain. What do you think the Latin word 'mons' means?"	mountain	½
16A. "In Hungarian, 'Nem, nem, soha' means 'no, no, never.' What does the word 'nem' mean?"	no; no, no	½
16B. In Polish, 'kierowac' powoli' means 'drive slowly' and 'kierowac' na prawo' means 'drive to the right.' What does 'kierowac' mean?"	drive	½
17A. "Say something that has these words in it: 'toy" and 'birthday'."	any correct sentence using both words. (Be sure to reproduce answer.)	½
17B. "Say something that has these words in it: 'hungry' and 'eat'."	See 17A	½
18. "Say something that has these three words in it: 'city', 'live' (pronounced as a verb) and "apartments." "	Same as for 17A	1
19. (Show picture of mesa.) "This is a mesa—— a flat place on the top of a hill (indicating). Do you think the Spanish word mesa meant bathtub, or table, or curtain?"	Table	1
20. "John lives in this house (indicating the one on the left) and Sandra lives in the one adjacent. What do you think the word 'adjacent' means?"	next, next to, next door	1
21. "Things that are concentric have the same center." Show four groups of circles. "Which of these groups of circles is concentric?"	C	1
22. "A lunar expedition is a trip to the moon. What do you think lunar light is——electric light, or sunlight, or moonlight, or starlight?"	Moonlight	1
23. "A man is a biped and a dog is a quadruped. A biped has two feet. How many feet has a quadruped?"	four	1

Verbal Items

		Expected Responses	Score
24.	"Finish this for me: 'Isn't' means 'is not'; 'didn't' means 'did not'; won't' means...."	will not	1
25.	"What does a sign mean when it says that something is forbidden?"	not allowed, against the rules, can't do it. not permitted, must not, should not. bad	1 ½
26.	"In the spiral of Archimedes the lines are all the same distance apart. Which of these is the spiral of Archimedes?"	A	1
27.	Show child a book of matches, an aspirin box, a package of Kleenex, and a pocket knife. "A conflagration is a fire. Which of these things could cause a conflagration?"	book of matches	1
28.	"Tell me all the things you have to do to take a bath."	filling tub, get in tub, washing or being washed, emptying tub, use soap, getting undressed, drying or being dried, getting dressed	1 =0 2,3 =½ 4,5 = 1
29.	"Tell me all the things you do when you buy a new pair of shoes."	go to the store, try on shoes, pay for them or charge them, measure foot, see if they fit, wear them or take them	1 =0 2,3 =½ 4,5 =1
30.	"You want to tell a child how to get his ring toy, that looks like this now (indicating left-hand picture A) to look like this (indicating the right-hand picture.) Tell him everything he has to do."	Take them all (or all but the bottom one) off. Place them back on in order of decreasing diameter.	1

Numerical Items	Expected Response	Score
1. "How many pieces of banana will there be if you break all these bananas in two?"	10	1
2. (Give child three long and two short peanuts.) "How would you divide these between two children, so that it would be fair?"	2 long to one child, 1 long and 2 short to other	1
3. "How would you divide up the apples so that the big boy would have twice as many as the little boy?"	4 for the big boy, 2 for the little boy	1
4. (Show child four large peanuts and two small ones, in the shell.) "The big peanuts each have two little nuts, like this (showing one) in them, and the small peanuts each have one. If you shelled all these, how many little nuts, like this (showing shelled peanut) would you have?"	10	1
5. (Show child groups of 5, 6, and 7 Lima beans.) "Which of these would be easiest to divide up evenly among three squirrels? Five beans, like this, or six beans, like this, or seven beans, like this? To divide up among three squirrels."	The 6- bean group	1
6. (Show child picture of three children sitting at a tea-table (pointing to them), nine apples in front of them.) "How would you divide up the apples so that each of three children would have the same number?"	3 apples each	1
7. "John has five carrots. He is going to give two carrots to each one of his rabbits. How many carrots will he have left?"	1	1
8. "It takes John four minutes to walk to school. How long will it probably take him to walk to school and back again?"	8 minutes	1
9. "There are usually ten children in the class, but three of them are home with the flu. How many are at school?"	7	1
10. "Which of these is half a dozen?"	The 6- circle group (B)	1
11. "How many feet are there on both these horses (pointing to each one) together?"	8	1

Numerical Items	Expected Response	Score
12. (Show child a cup with two markings on it, one at the quarter-full point and one at the half-full point.) "When the cup is full up to here, it is a quarter full (indicating.) When it is full up to here, it is half full (indicating.) If it is a third full, how far will it be full up to?" Credit any point between a quarter and a half.	Any point between a quarter and a half.	1
13. "A little girl is six years old today. How many years will it be until she is nine years old?"	3	1
14. "Mr. Jones worked two half-days this week. This is the same as how many whole days?"	1	1
15. "You are going camping and are taking potatoes for five boys. How many is that for each boy?"	2	1
16. (Show child picture of a box containing twenty apples.) "There are two apples this way (gesturing) and ten apples this way (gesturing). How many apples are there in the box? See if you can tell me without counting. There are two apples this way and ten apples this way." Give no credit for counting.	20 - no credit for counting	1
17. "Can you count by two's to ten, like this --- two, four...."	2, 4, 6, 8, 10. All must be correct.	1
18. "Jeffry is six years old when he starts second grade. How old will he probably be when he starts fourth grade?"	8	1
19. "At what time does the sun come up in morning, here in New York City?"	Any answer between 5 and 8	1
20. "About how many slices of bread are there in this loaf of bread? Don't bother to count, just guess." (Credit any answer between ten and twenty-five.)	Any answer between 10 and 25.	1
21. "Suppose you are in an elevator, going down from the sixth floor. What is the next floor you come to?.. And the next? .... etc."	5, 4, 3, 2, 1 or fifth, fourth, third, second, first.	

Numerical Items

		Expected Response	Score
22.	(Show child a strip of paper divided into seven squares.) "Show me where you would cut this to cut it exactly in two."	within the fourth square	1
23.	"One cat has four kittens and another has three kittens. How many kittens are there altogether?"	7	1
24.	(Show child a picture of a box of cereal.) "This box of cereal has enough in it for four bowls of cereal. How many breakfasts will that make for a boy and his brother?"	2	1
25.	(Show child a picture of two little girls.) "Peggy and Pam are sisters and they have two new twin brothers. How many children will that make?"	4	1
26.	"A puppy has one dog-biscuit for breakfast, and two for lunch, and three for supper. How many does he have all day?"	6	1
27.	(Show child a plastic adding-scale.) lay numbers out in order, facing the child.) "If you put a 1 and a 2 on this end, and a 3 on this end (doing so), it will balance, because 1 and 2 add up to 3. If you put a 3 and a 5 on this side, what one number should you put on this side? What does 3 and a 5 add up to?' If correct or incorrect answer is given, hang the weight on the scale.	8	1
28.	If child does previous item successfully, say "We'll leave the 3 and the 5 on this end. "Now, what two numbers could you put on this end to make it balance? What two numbers add up to the same as 3 and 5?"	1 and 7, 2 and 6, 4 and 4, 5 and 3	1
29.	"There are five presents for each of the children. How many does that make for all the children put together?"	15	1
30.	(Show child twelve pennies and a nickel.) "How many of these (indicating the pennies) will it take to be worth as much as one of these (indicating the nickel)?"	5	1

Reasoning Items

	Expected Response	Score
1. (Show child a picture of three groups of children.) "These children are in the first grade (pointing to the left-hand group) and these are in the third grade (pointing to the center group.) What grade do you think <u>these</u> children are in?" (Pointing to the third group.)	Second grade	1
2. (Show child a picture of two boys, a watermelon, and three boxes of cereal.) "The two boys have to carry these things, home. There is a watermelon and three boxes of cereal. How should they divide them up to carry, so that each boy will have nearly as heavy a load as the other?"	One boy carries melon; the other all 3 boxes of cereal	1
3. "If these things were arranged in the right order, which one do you think would be <u>in the</u> middle? Big...medium-sized...small."	medium-sized	1
4. "If these things were arranged in the right order, which one would be <u>in the middle?</u> Some. ... all....none."	Some	1
5. If these things were arranged in the right order, which would come last? Waking up... Going to school..... Getting dressed."	Going to school	1
6. "This is a bottle of milk that has been frozen. See--- the frozen milk is coming out the top of the bottle. When milk freezes, does it take up more room, or less room, or the same amount of room as it did before?"	More room	1
7. (Show child a rubber band.) "All rubber has carbon in it. This band is made of rubber. Does this band have carbon in it?" "Why do you think so?"	(a) Yes (b) Repetition of basic idea of syllogism, e.g. "you said rubber always has carbon in it."	½ ½
8. "Which of these does a cow <u>always</u> have? Horns? Milk? A bell? A hoof? A calf?"	Hoof	1
9. (Show child a cutout of a wheel.) "If the wheel squeaks when you pull the wagon, where on the wheel would you grease it?"	At the center (or hub)	1

Reasoning Items	Expected Response	Score
10. (Show child cards with 2 balls and square.) "See these two pictures up her (indicating.) See how this one (indicating the one on the upper right) goes with this one (indicating the one on the upper left.) Now take the cards (handing them to the child) and find the picture that goes with this one (indicating the one on the lower left) in the same way that this one (indicating the picture on the upper right) goes with this one (indicating the one on the upper left.)"	C (the square)	1
11. (Give child cards with pictures of a bed, a cot, and a cradle.) Point to the blank frame on the larger card. "Which of these pictures (indicating the small cards) belongs with this one (pointing to the crib) in the same way that this (pointing to the rocker) belongs with this? (pointing to the straight chair.)"	B (the cradle)	1
12. "John was the shortest child in his grade last year, but he grew four inches during the summer. Is he the shortest child this year?" "Why do you think so?"	(a) Can't tell (b) Because you don't know how tall the other children were or how fast they grew?	½ ½
13. "Both these pails have holes in them. Which one would be better to carry water in?" "Why?"	(a) A (b) because hole is higher; less will leak out.	½ ½
14. (Arrange white, pink, and red squares in that order. Hand child white, lavender, and purple squares, with purple on the bottom, white in the middle, and lavender on top.) "See how I have put these squares. Now you put these the same way."	White, lavender, purple (B, A, C)	1
15. "Finish this for me. A car's wheels are like a horse's... what?"	hooves, feet, legs	1
16. "Finish this for me. A sidewalk's concrete is like a frying pan's... what?"	metal, iron, aluminum, etc.	1
17. (Show child a doll-dress.) "When they were making the doll-dress, did they sew up the back seam (indicating) first or did they sew the hem(indicating) first?" "How can you tell?"	(a) Hem (b) any correct explanation to explain by showing is acceptable.	½ ½

Reasoning Items	Expected response	Score
18. "These are a man's footprints. "Why do they look different over here (indicating)?"	Running, or tiptoe	1
19. (Show child a picture of a boy, a girl, and a clothesline.) "If the boy pulls the upper rope (indicating it) toward him, show me which way the towel will go. Toward him, or toward the girl? Or will it not move at all?"	Toward the girl	1
20. "If the trees were farther apart, would the hammock be higher, or lower, or just as high as it is now?"	Higher	1
21A. "Would the hammock fall down if you cut this rope (pointing to one of the small ones near the hammock)?"	(A) No	½
21B. "Would the hammock fall down if you cut this rope (indicating the rope nearest the tree)?"	(b) Yes	½
22. (Show child picture of a boy in a bathtub and another boy standing beside the tub.) "Charles is taking a bath in the tub. If his brother gets into the tub with him, what will the water do? Will it come up higher, or go down lower, or stay where it is?"	Come up higher	1
23. (Show child a picture of a child's steel wagon.) "It rained last night, but there is no water in Bill's steel wagon this morning. How could that be?" After each reason given, say, "And what other reason could there be?"	Hole in wagon, wagon not there last night, etc. (a) one reason (b) more than one reason	½ ½
24. "John goes to town on his bicycle. It always takes him much longer to go to town than it does to come home. Which is probably up on a hill, his home or the town?" "How do you know?"	(a) town. (b) Bicycle goes slower uphill, or other acceptable reason.	½ ½
25. (Show child toy gear set, with two gears touching.) "These two things that look like wheels are called gears. The humps on them (indicating) fit into each other where they touch (indicating). When the white gear is going round and round this way (motioning clockwise with finger) what way is the black gear going? Is it going around in the same direction, or in the opposite direction?" (Be careful not to turn the gear while indicating the direction.)	Counter clockwise (opposite)	1

Reasoning Items

		Expected Response	Score
26.	"Which way is the wind blowing in this picture (indicating picture of house)?" "Which way is the wind blowing in this picture (indicating picture of truck)?" Score second part of item only.	Can't tell	1
27.	"It is night-time, and the boy is looking at the moon. The moon gets its light from the sun. In which direction is the sun in this picture?"	From the right (or general direction indicated)	1
28.	"All of the pipes on these tanks are full of water. Which of the tanks is filling up fastest?" If child's answer is correct (A) say, "That's right. How can you tell?"	(a) A (b) In through large pipe, out through small one, or any acceptable reason	½ ½
29.	"Why does the sink have holes in it here?" If child says "For water to run out of", say "What would happen if the holes weren't there?"	(a) For water to run out of (b) Sink would run over	½ ½
30.	(Show child a picture of two intersections.) "These are pictures of roads. Here is one road, and here is another one (indicating A and B). Which of these roads is more dangerous to drive along, this one or this one?" "Why?"	(a) B (b) Cross traffic	½ ½

Science Items

	Item	Expected Response	Score
1.	(Show child a shell, a peanut, a ball of clay, and a piece of candy.) "Which one of these is a seed?"	The peanut	1
2.	(Show child a picture of an armadillo.) "What is this?"	Armadillo Imperfect attempt at name	1 ½
3.	(Show child pictures of a horse, a cat, a koala bear, and an orang-utan.) "Which one of these animals is the smartest?"	Orang-utan, monkey, etc. Pointing to correct alternative	1
4.	(Show child an assortment of seashells, all different except that two of them are of the same species, though one is small and one is large.) "Here are some sea shells, that little sea animals once lived in. Which two of them belonged to the same kind of sea animal?	Flat white ones	1
5.	(Show child card with pictures of three glasses of different substances.) "This is syrup, and this is water, and this is milk (indicating). Which will it take longest to pour out of the glass, the syrup, or the water, or the milk?"	Syrup (A)	1
6.	"When you wring out some clothes you have washed, and hang them up to dry, where does the water in them go to?"	Into the air, into the sky in the summer	1 ½
7.	"When do things melt?"	When they are surrounded by something warmer then themselves, or when they gather up water. (credit either)	1
8.	"If you wanted a carton of ice cream to stay frozen, would it be better to wrap it up in a blanket or to shut it up in the cupboard? Why?"	(a) Wrap it in a blanket. (b) Keeps heat out or any acceptable reason	½ ½
9.	"When water is solid what do we call it?"	Ice or snow	1
10.	(Show child a piece of wood, a nail, a jack, and a metal dish.) "Which of these things will float?" If only one is named, say, "anything else?"	Pan, piece of wood	½ credit for each right, ½ off for each wrong, no negative credit.

Science Items

	Item	Expected Response	Score
11.	(Show child two different types of postal scales.) "You know that this scale weighs things just right, but you don't know whether this one weighs things right or not. How can you find out?"	Weigh something on one, then on the other.	1
12.	(Show child segmented disc, colored red and white, impaled on straightened paperclip.) "If you were to spin this around very fast, what color would it be?"	Pink Orange	1 ½
13.	"Could you fly a kite inside a large building?" If answer is yes, probe to make sure child is not postulating a wind tunnel, a large electric fan, or some similar arrangement.	(a) No (b) No air currents	½ ½
14.	"Here is a stone rolling down the hill. Will it be rolling faster here, or here, or here? (indicating A, B, and C.) Or will it be rolling just as fast all the way down?"	C	1
15.	"If your car bumps into a tree, are you more likely to be thrown forward, through the windshield, or backward, into the back seat? Or does it depend on how fast you are going?"	Thru the windshield	1
16.	(Show child a picture of a child holding a full balloon, pinched by its neck.) "If the boy lets the air out of the balloon suddenly, in which direction will the balloon go? This way, or this way? (Gesturing to right and left). Or will it fall to the ground right away?"	To right of picture (pointing accepted)	1
17.	(Show child a picture of a tree, with roots and leaves.) "What part does the tree eat and drink with?"	Roots (pointing accepted)	1
18.	"What part does the tree breathe with?"	Leaves (pointing accepted)	1
19.	(Show child a picture of an electric lamp) "If this lamp wouldn't light, tell me some things you could do to find out why."	See if plugged in, see if bulb is screwed in, see if bulb is good, or any rational answer.	½ for each correct reason, maximum 1
20.	"How many holes are there in an electric socket---the kind you plug an iron or a toaster into?"	2	1

Science Items

	Item	Expected Response	Score
21.	"Why should you never touch the place where you screw a light-bulb in?"	Danger of shock	1
22.	(Show child a compass.) "What is this? What is it for?"	(a) Compass (b) To tell direction	½ ½
23.	"Why couldn't people live on the moon the way they do on the earth?"	No air, lack of water (credit either)	1
24.	"There is no air on the moon. Could you use a parachute on the moon?" If child answers no, "Why not?"	(a) No (b) No air to catch in parachute	½ ½
25.	"What shape is the earth?"	Round	1
26.	(Show child a tiny globe.) "Show me a continent that is mostly south of the equator."	South America or Africa	1
27A.	(Show child a small globe.) "Show me where we are." (Credit if he gets the continent right.)	Anywhere on the North American continent	½
27B.	(Show child a small globe.) "Show me the North Pole." (Credit any point within the Arctic Circle.)	Anywhere within the Arctic Circle.	½
28.	"This is the way the sun looks on different planets. Which of these planets is farthest from the sun?"	C	1
29.	"Is this sun coming up or going down, or is there no way to tell?"	Can't tell	1
30.	"What would happen if the sun went out, and never shone any more?"	Dark and cold Dark and cold, plants would not grow or animals would have no food.	½ 1

APPENDIX B

THE HUNTER APTITUDE SCALES FOR GIFTED CHILDREN

DIRECTIONS FOR ADMINISTRATION AND SCORING OF FORMS A AND B

Introduction.

The Hunter Aptitude Scales for Gifted Children must be administered individually by qualified examiners trained in the use of tests such as the Stanford-Binet Scales or the Wechsler Intelligence Scales for Children. In general, the Hunter Scales are easier to administer because neither individual items nor tests are timed. Considerations of rapport and motivation of each child tested are of paramount importance.

The Hunter Scales are useful in identifying and ranking children in the highest 5% of the American population in each of the aptitudes measured from ages 5 through 8. Norms are still in process of development. Their unavailability at present is not a serious handicap, however, when it is desired to use tests that will identify gifted children and place them in rank order in each aptitude measured.

It is recommended that the Hunter Scales be given in not less than three testing sessions of about 40-50 minutes each.

Space.

1. Hidden Figures.

   Directions: Show the first picture card and say, "Which one of these three things up here (pointing to top segment) can you find in the picture down here (pointing to bottom segment)?" Present other picture cards in the same way.

   Scoring: One point for each correct response. Child usually points to it.

2. Judging Size.

   Directions: Show child the pile of beads and the sample cardboard form. Say, "We want to cover this piece of cardboard with blocks. See, it takes just two blocks to cover it." (Demonstrate covering it. Then take off the blocks.) Next, say, "You use the blocks to cover up the cardboard." (Let the child do it, correcting as necessary so that he gets it right. Then remove the sample and all but one block.)

Say, "Now tell me how many blocks you would need to cover this piece of cardboard (Showing the form for item 5)." Put the form on the table but do not allow the child to use the remaining block to estimate how many are needed to cover it. He is not allowed to trace on the form. Present items 6, 7, 8, and 9 similarly.

Scoring: One point for each correct response.

3. Object Completion.

Directions: Show the first card and say, "I have a picture here that has some lines missing. If all the missing lines were drawn in, what would it be a picture of?" If child names first object correctly, go on to item two, etc., saying each time, "What would this be a picture of?"

If child gets item ten wrong, say, "No. It is a _____. (Give correct response.) If the missing lines were drawn here and here (pointing), it would be a _____."

For items after ten, accept a wrong answer without comment and go on to the next.

Scoring: One point for each correct response given by child without help.

4. Jigsaw Puzzles.

Directions: Show child item 17 positioned so that the completed form is beyond the pieces on the table in front of him. The pieces are laid out with painted surface up according to numbers from left to right on backs of pieces. Arrows on back point away from the child. Say, "Put these pieces together so they make a shape like this (pointing to completed form). Tell me when you have finished." If child cannot do item 17, guide him to correct placement. Then go on to item 18. Do not help him on any other item of this type. Use same directions with each of following items. If child has not finished in three minutes, it is best to go on to the next item.

Scoring: One point for each correct duplication of completed form in any orientation. Child should indicate he has finished.

5. Estimating Path.

Directions: Show card for item 27 and say, "See this airplane. (Point to airplane.) Its trail (point along contrail) show the path it is following.

This trail (pointing) shows it is going in a straight line. Here it goes into the cloud (point). If it follows the same straight line, where will it come out of the cloud — here, or here, or here, or here (indicating lettered points)?

If child gets item 27 correct, accept answer, credit it, and go on to items 28, 29, 30, 31, 32, 33, 34, saying each time, "Where will this one come out of the cloud?" If child gets item 27 wrong, guide him to choose the correct response while explaining the item. Then go on to item 28. Do not explain either items.

Show item 35 and say, "The rest of the pictures show <u>two</u> airplanes. Here are <u>two</u> airplanes. (Point to them.) This one (pointing) is going in a straight line. (Follow the path straight across the card.) This one (pointing) is following the path shown by its trail. (Follow contrail with finger.) At which point will it cross the path of the other airplane — here, or here, or here, or here (indicating lettered points)? Which one of these places (indicating letter points again) will it hit?"

Present items 35 through 41, saying each time, "At which point will it cross the path of the other airplane?"

<u>Scoring:</u> One point for each correct response.

6. Roll-up Figures.

<u>Directions:</u> Place the four pieces for the sample item in front of the child in alphabetical order from left to right according to the letters on the backs of the pieces. Say, "One of these pieces can be folded on the dotted lines to make this (pointing to the sample object). See, if I folded this one (piece A) here and here (demonstrating) I would make this shape. The other pieces (pointing to B, C, and D) are not shaped right."

"Now let's try another one." Place the object and pieces for item 42 in front of the child and say, "Look at all four of these pieces (Touch A, B, C, and D in order) and tell me which one could be rolled up or folded on the dotted lines to make this (pointing to sample object). Don't fold the pieces but look at all four of them and decide which could be rolled up or folded on the dotted lines to make this (pointing)." Do not allow the child to roll or fold the pieces, but encourage him to use visual means in selection.

Continue in the same way with items 43, 44, 45, and 46.

Scoring: One point for each correct response.

7. Cubes.

Directions: Put the card and cut-out for the sample item in front of the child. "See this? What is it? (Point to Block A.) Yes, it is a block with designs on its sides. Here are three more blocks. (Point to B, C, and D) Now see this figure made up of six little squares. (Point to squares one by one.) If this figure in the middle were cut out and folded on the dotted lines, it could make one of these blocks. Here is the figure all cut out for us (Take the sample cut-out.) Watch me put it on the block. (Do this.) Now you do it. (Let child do it.) Good. Which one of these blocks could it make? (Turn the block to look like Block C.) See, it could make this one. Now try this one. (Take card for item 47.) We don't have a cut-out this time, so you look at this (Center figure) and think which block it could look like if it were folded on the dotted lines." Record response as given. If it is correct, say "Good." (Then compare sides to show why it is correct.) If it is incorrect, say, "Let's look again." (Then point to correct block and compare sides to show why that one is correct.) Then go on to items 48 through 56, saying each time, "Now try this one. Which block would this (point to center figure) look like if it were folded on the dotted lines."

Scoring: One point for each correct response.

8. Perspective

Directions: Put sample item in front of child. "This picture shows a little girl (point to her) looking at a church (point to it). She is standing here (point) and looking at the church this way. (Indicate by moving pencil direction of her vision.) Notice that she sees the side of the church with the steeple toward the right. A little farther to the right she sees the back of the auto. Now which one of these pictures (point to A, B, C, and D) shows what she sees? This is wrong (A) because the steeple is on the left. So is this one (B). This one (C) shows the back of the church, which she cannot see (Show this on stimulus picture.).

This one (D) shows the side of the church with the steeple on the right. It also shows the back of the auto farther to the right. So it must be correct." Go over this as necessary to explain it to the child.

Present items 57, 58, 59, and 60, saying each time, "Now let's try this one. Which one of these pictures shows what the little girl sees?"

Scoring: One point for each correct response.

Vocabulary.

1. Picture Vocabulary.

Directions: Place the first picture before the child and say, "What is this?" (pointing to picture) Use the same directions for items 2 through 6. For items 7-8, say first, "What is this?" After getting response, say, "What is it for?" Use the same directions for items 9-10.

Scoring: One point for correct response as given on key or as judged fully equivalent.

2. Definitions.

Directions: Say, "What do we mean by _____?" (giving word for item 11) Continue with item 12 through 60 in the same manner, varying question by saying, "What does _____ mean?"

Scoring: One point for each correct response as given in key or as judged fully equivalent.

Number.

1. Enumeration

Directions: Show the cards one by one asking the question at the top of the card.

Scoring: One point for each correct response.

2. Addition

Directions: Show the sample card and say, "2 and 2 is 4." Then show the card item 11 and say for Form A: "2 and 4 is what?" For Form B, say, "2 and 3 is what?" Continue in same manner with items 12 through 25.

Scoring: One point for each correct response.

3. Subtraction

Directions: Show the sample card and say, "3 take away 2 is 1." Then show the card for item 26 and say for Form A: "4 take away 2 is what?" For Form B, say, "5 take away 3 is what?"

Continue in same manner with items 27 through 40.

Scoring: One point for each correct response.

4. Multiplication

Directions: Show the sample card and say, "2 times 4 is 8." Then show the card for item 41 and say for Form A: "2 times 3 is what?" For Form B, say, "2 times 5 is what?" Continue in same manner with items 42 through 50.

Scoring: One point for each correct response.

5. Division

Directions: Show the sample card and say, "6 divided by 2 is 3." Then show the card for item 51 and say for Form A: "8 divided by 2 is what?" For Form B say, "4 divided by 2 is what?" Continue in the same manner with items 53 through 60.

Scoring: One point for each correct response.

Reasoning:

1. Picture Analogies

Directions: Show the sample-item card with the blank frame in it. Say, "See this little chair (pointing to upper left). See this big chair (pointing to upper right)." Point to lower left and say, "What is this? Yes, it's a little table. Now what should go in here (pointing to lower right) that would go with a little table the way a big chair goes with a little chair?" (point to each.) Show card with objects A, B, C, and D on it and say, "Which one of these belongs in here?" (pointing to lower right blank on first card)

If child chooses big table, say, "Good. The big table goes with the little table the same way a big chair goes with a little chair."

Try to make sure child understands this. Then say, "Here is another set of pictures. Which one of these pictures (pointing to A, B, C, and D) belongs in this space (indicating lower right) in the same way that this (pointing to upper right) belongs with this (upper left)?"

Continue with items 2 through 20 in the same way.

Scoring: One point for each correct response.

2. Verbal Analogies.

Directions: "I have a sentence with one word left out. I'd like to have you tell me what that one word should be." Show the card for the sample item and say, "Try this one: A suit goes on a man the way a what goes on a woman?" (pointing to blank space as you say, the word "what")

If child answers correctly, say, "Good," and go on to items 21 through 40. For each, show the card and say, "Try this one." Then read the sentence, substituting "what" for the blank space.

Scoring: One point for each correct response.

3. Picture Arrangement.

Directions for Form A: Lay out the cards for item 41 from left to right in numerical order as indicated on the backs of the cards. Then say, "These pictures tell a story about a little girl who painted a picture, but the order of the pictures is mixed up. I'd like to have you put the pictures in the correct order so that they will tell a good story. Dot it now."

If the child puts the cards in the correct order, record this fact and say, "Good. Here she starts to paint. Here she is painting. Here she has finished and shows her painting to a friend."

If the child cannot do the task or puts the cards in an incorrect order, record this fact and say, "Watch me and see

how I put them in the correct order to make a good story." Then put them in the correct order, saying as it is done, "Here she starts to paint. Here she is painting. Here she has finished and shows her painting to a friend."

Directions for Form B: Layout the cards for item 41 from left to right in numerical order as indicated on the backs of the cards. Then say, "These pictures tell a story about a little boy who painted a chair, but the order of the pictures is mixed up. I'd like to have you put the pictures in the correct order so that they will tell a good story. Do it now."

If the child puts the cards in the correct order, record this fact and say, "Good. Here he starts to paint the chair. Here he is painting the chair. Here he has finished and is looking at the chair."

If the child cannot do the task or puts the cards in an incorrect order, record this fact and say, "Watch me and see how I put them in the correct order to make a good story." Then put them in the correct order, saying as it is done, "Here he starts to paint. Here he is painting. Here he has finished and is looking at the chair."

Directions for Forms A and B: Next, say, "Now we'll try another set of cards." Lay out item 42 and say, "Now put these in the correct order so that they will tell a good story. Do it now."

Continue in the same way with items 43 through 50.

Scoring: One point for each correct arrangement, including the first item if done without help.

4. Jump Peg.

Directions: "Here is a nice game. We want to play so that one peg will be in the center hole (point to it) when we finish, so have to get rid of all the pegs except one and that one must be left in the center hole (point). To get rid of the pegs, we

jump over one peg with another and then take away the one we jumped over (demonstrate jumping). We can jump over a peg only with one next to it. We must jump straight this way (indicate by jumping up once and down once) or straight across this way (indicate by jumping to left once and to right once). We cannot jump slantwise, like this (indicate)."

Set up the board for sample A. "Here is the first game. We want to finish with only one peg in this center hole (point). So I jump over this one, take it out, and I have one peg left in the center hole. Now you try it. Set up board again for sample A and have child play the game. Help him as needed.

Set up the board for sample B. Say, "Here is another one. We want to finish with only one peg in the center hole (point). So I jump over this one, take it out; jump over this one, take it out; jump over this one, take it out; and now I have one left in the center hole. Now you try it." Set up board again for sample B and have child play the game. Help him as needed.

Set up the board for item 51. Say, "Here is another one. Now you play the game so that you will have only one peg left in the center hole (point). Go ahead."

Repeat this process with items 52 through 60. Do not give further help.

Scoring: When the child has finished or cannot go farther, count the pegs remaining and subtract this from the number at the beginning of that game; then add one point if only one remains and it is in the center. The result is the score for each game. The sum of the game scores is the Jump Peg Score.

Science.

Directions: Ask questions on the record sheet for the Science test and note down responses in the spaces provided.

Scoring: One point for each correct response as indicated on scoring key or as judged fully equivalent to keyed responses.

APPENDIX C

COMPARISON OF APTITUDE SCORES OF EXPERIMENTAL AND CONTROL CLASSES

As described in section I of this report, the test scores used in the admission of applicants to the experimental class were the Preliminary Screening and Preliminary Selection Tests. However, all of the children who were admitted were given the Stanford-Binet Scales by qualified examiners following the administration of the Preliminary Selection Test. The test scores used in the admission of children to the control class were IQ's derived from the Stanford-Binet Scales. These were administered early in 1958 by qualified psychologists of the parents' choice; the scores were sent to the Elementary School for its consideration in admitting pupils.

The mean Stanford-Binet IQ's for the children in the experimental and control groups are shown in table 28. The control-class mean is 21.22 points higher than the experimental-class mean, a difference that is statistically significant at a very high level. If this large difference reflected a true difference between the general mental ability of children in the experimental and control groups, one would expect the control group to obtain significantly higher mean scores on various aptitude tests. Data bearing on this expectation are reported in tables 29, 30, and 31.

In table 29 the mean scores of the same children are shown on the SRA Primary Mental Abilities Tests (ages 5-7) in Space, Verbal, and Number and on the Preliminary Selection tests in Reasoning and Science. These were given prior to or close to the beginning of the school year 1958-1959. Instead of being considerably lower than the control-group mean, however, the experimental-group mean is higher in every instance; the difference reaches statistical significance at better than the 5% level for a two-tailed test of the null hypothesis in the case of the Science test.

Table 30 shows the mean scores for children in the experimental and control groups on four sections of the SRA Primary Mental Abilities Test (ages 7-11) given near the close of the school year 1958-1959. The experimental-group means are significantly higher than the control-group means in the Space, Verbal, and Reasoning tests. The control-group mean is slightly higher only on the Number test.

A comparison of the mean scores of both groups on the Hunter Aptitude Scales for Gifted Children is presented in table 31. These tests were also given at the end of the school year 1958-1959. Again, the experimental-group means are significantly higher on all except the Number test, on which the mean is significantly lower.

TABLE 28

MEAN SCORES OF EXPERIMENTAL AND CONTROL CLASSES ON THE STANFORD-BINET SCALES (FORM L)[a]

Class	N	Stanford-Binet Intelligence Quotient
Experimental	27	131.70
Control	26	152.92
t (experimental VS. control)		6.41[b]

[a] All experimental children received the Stanford-Binet Intelligence Test in June 1958; those control subjects entering Hunter College Elementary School at nursery-school age took the Stanford-Binet in May 1956; other control children took the test in May 1957 or May 1958.

[b] $p < .01$ (two-tailed test)

TABLE 29

MEAN SCORES OF EXPERIMENTAL AND CONTROL CLASSES IN TESTS OF 5 MENTAL CHARACTERISTICS GIVEN AT BEGINNING OF SCHOOL YEAR 1957-1958

Class	N	Area: PMA Space[a]	PMA Vocabulary[a]	PMA Number[a]	Preliminary Selection Reasoning[a]	Preliminary Selection Science[a]
Experimental	27	16.67	39.04	19.52	14.85	13.05
Control	26	15.46	37.27	19.42	14.15	11.42
t (experimental vs. control)		1.02	1.57	.10	.79	2.28[b]

[a] Of the 27 experimental children, seven took the Preliminary Selection Reasoning test in June 1958, twenty in September, 1958; nine received the Preliminary Selection Reasoning test in June 1958, eighteen in September 1958. Of the 26 control children, one received the Preliminary Selection Reasoning test in June 1958, twenty-five in September 1958; all control children received the Preliminary Selection Science test in September 1958. All experimental and control children received the SRA Primary Mental Abilities Test for Ages 5-7 in September 1958.

[b] $p < .05$ (two-tailed test)

TABLE 30

MEAN SCORES OF EXPERIMENTAL AND CONTROL CLASSES ON SRA PRIMARY MENTAL ABILITIES TEST (AGES 7-11) AT END OF SCHOOL YEAR 1958-1959

		Area			
Class	N	Space	Vocabulary	Number	Reasoning
Experimental	27	14.55	15.11	6.18	15.16
Control	25	10.96	12.04	7.37	12.60
t (experimental vs. control)		3.29[a]	2.55[a]	.61	3.53[a]

[a] $p < .05$

TABLE 31

MEAN COMPARABLE SCORES OF EXPERIMENTAL AND CONTROL CLASSES ON HUNTER APTITUDE SCALES FOR GIFTED CHILDREN AT END OF SCHOOL YEAR 1958-1959

		Area				
Class	N	Space	Vocabulary	Number	Reasoning	Science
Experimental	27	57.0	59.3	58.0	58.6	60.5
Control	27	54.5	55.4	60.8	55.4	53.9
t (experimental vs. control)		1.62	5.27[a]	5.83[a]	5.00[a]	5.20[a]

[a] $p < .05$ (two-tailed test). The denominator term in the t ratio was the population estimate of the standard error of measurement of the difference (not the standard error of the difference). Thus, p indicates the probability that the difference between the means of the two groups compared would occur as a chance deviation if the difference between the true means of these groups were zero.

Although the correlations of the Stanford-Binet IQ's with the other aptitude-test scores are not perfect, they are moderately high (after correction for attenuation). Therefore, given the data in Tables 29, 30, and 31, it is not reasonable to ascribe the difference of 21.22 points between the mean IQ's of the experimental and control groups to a true difference in favor of the control group. As a matter of fact, it is very likely that the mean aptitude of the experimental group is truly the higher of the two. It is also likely that the the gains in number ability in the control group reflect real differences in the content of the curriculum and in the teaching methods employed.

How, then, can the data in table 28 be explained? The explanation is probably related to the purpose for which the Stanford-Binet IQ's were obtained for the pupils in each group. In the case of the control group it was known by the parents and psychometrists that the IQ's would have a controlling influence in their admission to the Elementary School. The children in the experimental group had already taken the tests to be used for admission purposes before they took the Stanford-Binet Scales, and it was known that the Binet IQ's were not to be used for admission purposes. Consequently, there was no incentive to coach these children on the Stanford-Binet materials.

There is much informal evidence that many parents who seek to have their children admitted to Hunter College Elementary School do coach their children for the Stanford-Binet Scales. Most of these children are superior in mental ability; the coaching is, therefore, highly effective and leads to an average spurious increase in IQ of 20-25 points. It is highly probable that the average IQ of pupils in the Elementary School is overstated to this extent by their initial Stanford-Binet IQ scores.

Perhaps the most disturbing implication of the data is that some children whose parents do not coach them are likely not to be considered for admission to the school even though they may be more highly gifted than some of those admitted. The most compelling implication of the data is that a reconsideration of the admission-testing program of the school be undertaken.

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